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## MIL-T-15071B(SHIPS)

	Heavy cruisers and larger type ships	Smaller ships	Small craft and submarines
Diesel generator sets	10	5	1
Distilling plants	10	5	1
Refrigeration plants	10	5	1
Gasoline handling systems	10	5	1
Submarine electrical propul- sion equipment	--	-	1
Ships service switchboards and motor generator sets	--	-	1
Main storage batteries	--	-	1

3.2.1 For ships constructed under the Mutual Defense Assistance Program only, the requirements of 3.2 (a) through (m) do not apply. Manuals for equipment and systems peculiar to ships constructed under the Mutual Defense Assistance Program shall be distributed as follows:

- (a) Six copies to the Military Assistance Advisory Group of each foreign Government assigned a ship of the class.
- (b) One copy to the Washington, D. C. Naval Attache of the recipient Government.
- (c) Four copies to the Bureau of Ships.
- (d) One copy to the cognizant Supervisor of Shipbuilding.
- (e) Two copies with each unit of equipment for placement onboard ship (see 3.4.6).
- (f) One copy to the cognizant Inspector of Naval Material.
- (g) Twelve copies to the Naval Supply Depot, Mechanicsburg, Pennsylvania.

Note. - Military equipment is defined as the auxiliary machinery necessary for the operation, maneuverability and combatant efficiency of the vessel.  
Nonmilitary equipment is defined as ranges, coffee making apparatus, food mixing machines, sterilizers, laundry machines, sewing machines, refrigerators.

3.3 Type A manuals. - Type A manuals shall be as specified in the individual contract or order.

3.4 General requirements for types B, C, and D manuals. -

3.4.1 Identification. - All manuals shall be identified by a Navy identification number of the form "NAVSHIPS 000-0000" (see figures 1 and 2). This number will be assigned by the bureau or agency concerned upon a receipt of a preliminary copy submitted for bureau or agency approval. In urgent cases, this number may be obtained by a written request, containing complete descriptive data of the equipment. This number shall be imprinted on the upper left-hand corner of the cover, and the upper right-hand corner of the fly-leaf of all manuals prior to distribution.

3.4.2 Reproduction copy. - If offset negatives are used in the publication of the technical manuals, a complete set of such negatives shall, after completion of the manuals, be delivered to the Naval Supply Depot, Mechanicsburg, Pennsylvania and shall remain the property of the Government for use in subsequent reproduction of the manuals. Regardless of the method of printing used, one glossy print or negative of each half-tone illustration included in the manuals, shall be delivered to the Naval Supply Depot, Mechanicsburg, Pennsylvania, and shall remain the property of the Government for use in subsequent reproduction of the manuals. This requirement does not apply to type D manuals (3.7) nor to manuals for which reproduction copy has been previously furnished.

3.4.3 Copyright. - Technical manuals shall not be copyrighted. The bureau or agency concerned reserves the right to reproduce or have reproduced in part or in entirety all manuals procured under this specification.

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3.4.4 Security classification. - Unless otherwise specified in the contract or order, manuals shall be unclassified. If classified, notification of the classification shall appear on the front and back covers and each page of the manuals as shown on figures 1 to 5, inclusive. In addition, classified manuals shall have the following paragraph printed on the title page as shown on figure 2:

“WARNING: This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794. The transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.”

Classified manuals shall be marked with consecutive serial numbers beginning with number 1. Receipt cards shall be provided in all classified manuals. Each card shall contain the serial number of the manual in which it is included.

3.4.5 Revision to incorporate changes. - New, revised, or supplementary pages shall be furnished until the guarantee period expires. The quantity of pages furnished and the distribution shall be the same as for the manual provided in the original contract or order.

3.4.5.1 New pages. - When it is found necessary to include new information to augment the manual data, new pages shall be issued. These pages shall be identified with the following legend placed in the bottom outside corner, beside the page number and toward the binding edge of each page; on the first line, the word “New” followed by the NAVSHIPS identification number, and on the second line the month and year of issue. New pages shall bear the same number as the manual page they follow with the addition of a letter; for example, original page 69, new pages 69a and 69b. A reproduction copy of each new page shall be provided.

3.4.5.2 Revised pages. - If it is determined that information originally furnished in manuals must be changed for clarification, correction, or because every equipment covered by the manual has been uniformly modified, revised pages shall be issued. These pages shall be identified with the following legend placed in the bottom outside corner, beside the page number and toward the binding edge of each page; on the first line, the word “Revised” followed by the NAVSHIPS identification number, and on the second line the month and year of issue. Revised pages shall bear the same number as the page they replace. A reproduction copy of each revised page shall be provided.

3.4.5.3 Supplementary pages. - In instances where modifications are made only to a certain number of the total number of equipments covered by the manual, resulting in the need for alternate instructions to cover those items modified, this information shall be issued in the form of supplementary pages. These pages shall be identified with the following legend placed in the bottom outside corner, beside the page number and toward the binding edge of each page; on the first line, the word “Supplementary” followed by the NAVSHIPS identification number on succeeding lines the hull numbers of the specific ships to which the page applies, and on the last line the month and year of issue. Supplementary pages shall bear the same number as the manual page they follow with the addition of a letter; for example, original page 69, supplementary pages 69a, 69b. A reproduction of each supplementary copy shall be provided.

3.4.6 Time of delivery. - Two copies of the manuals shall be delivered with the first unit and each succeeding unit of equipment shipped except that no more than ten manuals for heavy cruisers and larger and no more than six manuals for smaller ships shall be considered necessary to fulfill this requirement when it is known the equipment is destined for a particular ship (see 3.2 for specific exceptions). If final manuals are not available at the time of delivery of the equipment, two copies of an adequate preliminary manual (see 3.4.7) shall be furnished to the Government inspector to fulfill the above requirements for shipment of manuals for each unit.

NOTE: The importance of delivering these manuals with each unit of equipment cannot be too strongly emphasized, since they are of great value in the installation of the equipment and in training and indoctrinating the ship's crew.

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### 3.4.7 Preliminary manuals. -

3.4.7.1 Method of approval. - Prior to the printing of the final manuals, a preliminary manual shall be prepared and submitted in duplicate to the bureau or agency concerned via the Government inspector for approval and assignment of a Navy NAVSHIPS identification number. Every effort shall be made to submit the preliminary manual in ample time to permit approval and final printing prior to the delivery date of the equipment. Preliminary manuals shall be furnished in instances where final manuals are not available for delivery with the equipment. In all instances where preliminary manuals are furnished in lieu of final manuals, they shall be replaced with final manuals within 60 days (see 3.4.6 and 3.4.7.2.3).

### 3.4.7.2 Contents. -

3.4.7.2.1 Text. - Preliminary manuals shall consist of a complete text of the instructions required for the type of manual to be furnished.

3.4.7.2.2 Illustrations. - Preliminary manuals shall contain a list of all illustrations, (photographs, exploded views, drawings, and sketches) and sample art work (less photos and drawings but including all exploded views and sketches) which will appear in the final manuals. If the final manual is to include test data, or a table of weights, for example, and if any or all of the items are not available when the preliminary manual is issued, then a foreword shall list all items which have been omitted and which will appear in the final manual.

3.4.7.2.3 Manual identification. - In all instances where preliminary manuals are furnished in lieu of final manuals, the NAVSHIPS identification number shall be stamped on all copies of the preliminary manuals prior to distribution (see 3.4.1).

3.4.7.2.4 Covers. - Covers for preliminary manuals shall be at least 20 by 26-65/500-basis gray antique finish cover stock or similar material, bellows fold, with the title and other pertinent information on the cover. This information shall be identical with that which will appear on the final manual except that the word "preliminary" shall appear directly in front of the identification number (see 3.4.1).

3.4.7.2.5 Printing. - The text may be printed by any quick, economical method, such as multigraph, mimeograph or similar method.

### 3.5 Type B manuals. -

3.5.1 Contents. - Type B manuals shall contain the following information as applicable, presented in a logical arrangement (see figures 1 to 9, inclusive):

- (a) Title page (see figure 2).
- (b) General data (see 3.5.1.1).
- (c) Table of contents, listing all divisions and primary and secondary subdivisions (such as chapters, sections) with the corresponding page numbers.
- (d) List of illustrations and drawings, specifying titles, figure numbers and pages on which such illustrations appear.
- (e) Introduction (see 3.5.1.2).
- (f) Detailed description (see 3.5.1.3).
- (g) Installation instructions (see 3.5.1.4).
- (h) Adjustments and tests (see 3.5.1.5).
- (i) Principles of operations (see 3.5.1.6).
- (j) Operating instructions (see 3.5.1.7).
- (k) Maintenance (see 3.5.1.8).

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- (l) Parts identification (see 3.5.1.9).
- (m) Drawings (see 3.5.1.10 and 3.5.2.4.5.4).
- (n) Memorandum pages (see 3.5.1.11).

Note. - Although these requirements are directly applicable to manuals covering specific equipment, they shall be followed as closely as possible for manuals covering systems, such as engineering piping systems. When a manual covers a system or an equipment composed of several distinct units (for example, a generating set consisting of a Diesel engine, a generator, a voltage regulator, and a controller), it may be desirable to arrange the manual in major divisions, each covering one unit. If so, the major divisions may be arranged by sub-divisions, each corresponding to the requirements herein.

3.5.1.1 General data. - This division shall contain data such as the following:

- (a) Safety notice (where high voltages or special hazards are involved) (see figure 9).
- (b) Component list containing:
  - Description of item.
  - Navy type designation.
  - Standard Navy stock number.
  - Dimensions.
  - Weight (with or without packing).
- (c) Input power requirements and heat dissipation.
- (d) Salient design characteristics.
- (e) Electron tube complement.
- (f) Serial number (if appropriate).

3.5.1.2 Introduction. - This division shall include a general description of the equipment; explain briefly what it is, where it is used, and what it will do, also all information of a general character applicable to the complete equipment. When the text contains technical terms or terms not commonly used, definitions shall be included.

3.5.1.3 Detail description. - This division shall contain a complete detailed description of component assemblies and accessories which comprise the complete equipment; for example, in the case of a ship's service turbine generator set, the turbine, the gear, the generator, the exciter, and the voltage regulator. Allowable clearances, temperatures or tolerances shall be shown in tabular form.

3.5.1.4 Installation instructions. - This division shall contain methods of installation, alignment, precautions, mounting instructions, recommendations regarding shielding, grounding or bonding.

3.5.1.5 Adjustment and tests. - This division shall contain instructions for the adjustment and test of the system and its major components upon initial installation or under other conditions such as after major overhaul where complete system readjustment may be required.

3.5.1.6 Principles of operation. - This division shall contain a brief resume of the principles of operation together with such illustrations, sketches, schematic piping diagrams and schematic wiring diagrams to convey an understanding of the function and operation of the equipment. Descriptions of components and assemblies using electron tubes should provide an explanation of the electronic circuits. A preferred method of describing electronic circuits is to present the description in sections, such as amplifier features, power circuits, main audio transmission path and mechanical arrangements. Theory of operation should be included where unusual or unconventional circuits or techniques are involved.

3.5.1.7 Operating instructions. - This division shall contain simple, brief and effective instructions, including normal routines and precautions such as maximum and minimum loads, normal temperature or pressure limits, to be observed in starting, operating and shutting-down the equipment. Where operations are to be performed in specific sequence, step-by-step procedures shall be used. Operations shall be numbered in the order in which they are to be performed. Operating data which is frequently referred to in operating the equipment shall be included in this division. Tables and charts shall be used for the presentation of these instructions where varying operating conditions are encountered.

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3.5.1.8 Maintenance instructions. -

3.5.1.8.1 Preventative maintenance. - This division shall cover all maintenance procedures, inspection and routine adjustments which should be performed periodically and regularly for the purpose of preventing failure or impairment of equipment. Included in this division shall be routine maintenance check charts containing the following:

- (a) A tabulation of periodic routine mechanical and electrical tests and checks which should be accomplished regularly to insure continuity of service at peak performance.
- (b) Arrangement of the table shall be such as to indicate what is to be done, when it is to be done and how to do it.
- (c) Emphasis shall be placed upon the test facilities which may be incorporated in the various components.
- (d) Instructions shall be provided for the care, inspection and cleaning of all pertinent parts.
- (e) Instructions on lubrication shall be provided as applicable, preferably in chart form. They shall include information regarding lubrication recommended by the manufacturer, the type of lubricant to be used, together with specific time periods. Lubricants shall be described by Military specification numbers where applicable and by commercial designations.
- (f) Instructions shall be included stressing the importance of properly maintaining any safety devices, interlocks, provided to prevent damage to equipment or injury to personnel.

3.5.1.8.2 Corrective maintenance. - This division shall cover all information necessary to permit a technician to locate trouble and to make repairs or adjustments to each component, assembly or sub-assembly of the equipment. Included in this division shall be the following:

- (a) Trouble shooting guides for the localization of faults giving possible sources of trouble, the symptoms, probable cause, and instructions for remedying the faults.
- (b) Complete instructions on signal tracing for electric and electronic circuits, use of test instruments and other common servicing techniques.
- (c) Ample illustrations, photographs, exploded views giving details of mechanical assemblies, and simplified schematic diagram of the electric circuits. Illustrations contained in other divisions may be used and referred to under this division without duplicating them.
- (d) Voltage and resistance diagrams or tables for each electronic assembly showing normal voltages (with and without audio signal) and resistances as measured at the terminals of each tube socket and at other significant points in the circuit.

3.5.1.9 Parts identification. - This division shall contain identification data covering all repair parts (parts and assemblies which are wearable or expendable during normal repair) to facilitate ready identification of parts for replacement and ordering purposes. This data shall be presented in one of the three following alternate arrangements:

- (a) Parts list and illustrations. - Where the manual does not include reduced size drawings which are prepared in accordance with the standard drawing format shown on Drawing S0103-73729, listing all repair parts, the parts identification shall be in the form of a parts list with illustrations, arranged as specified in 3.5.1.9.1 and 3.5.1.9.2.
- (b) Drawings and illustrations. - Where the manual includes reduced size drawings which are prepared in accordance with the standard drawing format shown on Drawing S0103-73729 (see figure 5) listing all repair parts, and where only mechanical parts are involved, the parts identification shall be in the form of illustrations to supplement the lists of material on the drawings. Illustrations shall be prepared for each assembly, subassembly and their component repair parts in accordance with 3.5.1.9.2 except that the index numbers shall be identical with the piece numbers assigned on the above drawings. Appropriate notes shall be added to these illustrations referring to the drawings on which the assigned numbers are listed.



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- (c) Drawings, illustrations and functional listing. - Where the manual includes reduced size drawings which are prepared in accordance with the standard drawing format shown on Drawing S0103-73729, and which list all repair parts, and where electrical or electronic parts are involved, the parts identification shall be in the form of a functional listing of electrical and electronic parts with illustrations to supplement both the functional listing and the list of materials on the drawings. The functional listing of all electrical and electronic parts shall be prepared in accordance with 3.5.1.9.1.3.2. Illustrations shall be prepared for each assembly, subassembly and the component repair parts thereof in accordance with 3.5.1.9.2, except that the index numbers shall be identical with the piece numbers assigned on the above drawings (for mechanical parts) and with the reference designation assigned on the schematic wiring diagram (for electrical or electronic parts) appropriate notes shall be added to these illustrations referring to the drawings on which the assigned numbers are listed.

3.5.1.9.1 Parts list. -

3.5.1.9.1.1 Contents. - The parts list shall contain the following information:

- (a) List of illustrations by figure and page number.
- (b) Introduction.
- (c) Parts tabulation.
- (d) Special tools.
- (e) Numerical index of part numbers.

3.5.1.9.1.2 Introduction. - This division shall contain sufficient instructions to explain the following:

- (a) Any symbols used therein.
- (b) The general system of group assemblies in relation to the complete article.
- (c) All cross-index systems employed.
- (d) Titles or other markings intended to segregate different models.
- (e) Other information as may be required to facilitate rapid and accurate use of the parts list.

3.5.1.9.1.3 Parts tabulation. - The parts tabulation shall contain the following information:

3.5.1.9.1.3.1 Tabulation for mechanical parts. -

- (a) Figure number. This shall denote the illustration number wherein the part has been shown.
- (b) Index number. This shall denote the index number covering the complete main or subassembly as listed in the catalog.
- (c) Name of part and brief description.
- (d) Number required.
- (e) Unit of issue.
- (f) Contractor's service part number.
- (g) Actual manufacturer's name.
- (h) Actual manufacturer's service part number.
- (i) Standard Navy stock number assigned in accordance with specification MIL-R-15137.

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3.5.1.9.1.3.2 Tabulation for electrical and electronic parts. -

- (a) Figure number. This shall denote the illustration number wherein the part has been shown.
- (b) Reference designation assigned in the schematic wiring diagram.
- (c) Name of part and brief description (including electrical ratings).
- (d) Function. The function shall consist of a brief statement of use, purpose or the function of the part in the component.
- (e) Military type number (where applicable).
- (f) Actual manufacturer's name.
- (g) Actual manufacturer's service part number.
- (h) Standard Navy Stock Number assigned in accordance with Specification MIL-R-15137.

3.5.1.9.1.4 Special tools. - This division shall contain a list of all special tools supplied with the equipment showing the quantity, unit of issue (each, pair, set), description, and manufacturer's identification number.

3.5.1.9.1.5 Numerical index of part numbers. - This index shall list all items contained in the parts tabulation, arranged in a logical numerical sequence. These items shall be so arranged that column 1 of the index will give the manufacturer's part number and column 2 will give the illustration index number or numbers in which the part appears.

3.5.1.9.2 Illustrations. - A view of each assembly, subassembly and the component parts thereof shall be shown. Identification of illustrated parts with the listed parts shall be facilitated by the use of key or index numbers which will identify all the parts in the group assembly listing.

3.5.1.9.2.1 Illustrations of the exploded type may be used. When the use of exploded views is not practical, simple cross-sectional views may be used. The cross-sectional drawings when used for this purpose preferably shall be approved drawings or excerpts from approved drawings, and shall show both the manufacturer's drawing number and the drawing number of the bureau or agency concerned. In case no applicable approved drawing is available, cross-sectional views from manufacturer's drawings may be used.

3.5.1.9.2.2 A figure number and proper identifying caption shall appear with each illustration. In the case of subassemblies or sub-assemblies, the caption shall also identify and give the index number of the complete assembly as it appears in the parts tabulation.

3.5.1.9.2.3 An index number with an arrow to the item, part, or tool to which it pertains shall be used in illustrations. In cases where an assembly is exploded into its component parts, one or more of which require further explosion, the primary explosion shall be referenced by the use of numerals only. The subassembly shall be referenced by the basic number of the part as it appears in the primary assembly but each exploded part shall have an alphabetical designation, suffixed to the number of the primary part. The sequence of numerical and alphabetical designations shall correspond to the order of removal upon disassembly, wherever practicable.

3.5.1.9.2.4 Index numbers and arrows shall be used on each illustration to identify repair parts only.

3.5.1.10 Drawings. - This division shall contain reproductions of approved drawings, additional block diagrams, exploded views or explanatory drawings, as necessary to supplement the descriptive matter contained in the text. Wherever feasible, such diagrams, exploded views and sketches should be inserted in the text as close as possible to that portion of the text to which they apply. Diagrams of switches and relays used in the system showing the terminal numbering shall be inserted as additional drawings. The standard color codes for resistors and capacitors shall be stated, where applicable.

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3.5.1.11 Memorandum pages. - Five blank pages shall be inserted at the end of the manual for memorandum purposes.

3.5.2 Format. -

3.5.2.1 Divisions (chapters or sections). - Divisions of manuals shall be by chapters or sections, numbered or lettered consecutively. In general, chapters shall be the main divisions of larger manuals and sections shall be the main division of smaller manuals. Chapters shall be further divided into sections which shall be numbered or lettered consecutively within the chapter. Where chapters are used, the first page of each chapter shall be arranged as shown on figure 3.

3.5.2.2 Page identification and numbering. -

3.5.2.2.1 At the top of each left-hand page, flush with the outside margin, shall appear a briefed title of the manual. At the top of each right-hand page, flush with the outside margin, shall appear the division, chapter or section number followed by its title. In some cases, it may be necessary to brief the title.

3.5.2.2.2 With the exception of fold-over pages and as otherwise specified herein, pages of the manuals shall be numbered consecutively in the bottom outside corner of each page, using Arabic numerals. The first page of chapter 1 or section 1 shall be page 1. All odd-numbered pages shall appear as right-hand pages. Fold-over pages shall be right-hand pages, and when they are used within the text they shall be assigned two page numbers, and the numbers shall be printed on the face of the sheet. Fold-over pages shall be arranged so that page numbers are visible without unfolding. Fold-over arrangements are shown on figure 5.

3.5.2.2.3 In manuals arranged for a system or equipment composed of several distinct units (see note under 3.5.1) the pages may be consecutively numbered within each chapter (or section), the first page of each chapter (or section) being page 1. In this case, the page number shall also include the chapter number. The chapter number shall appear first.

3.5.2.3 Layout treatment. - The layout of the manuals shall be such as to conserve space without detracting from the usability or clarity of material presented. Blank pages and spaces shall be avoided wherever possible except as specified in 3.5.1.11. Textual material shall be printed on both sides of the page. Illustrations serving no instructional function or to which no reference is made in the text shall not be used. Partial page illustrations within the text are highly desirable. Several small illustrations may be grouped to form a single page layout. Wherever possible, illustrations shall be located so that reference can be made from applicable text without turning a page. Fold-over pages, double, or triple pages will be permitted only for illustrations where this procedure is essential to insure legibility. Fold-over pages shall be used primarily in the back of the manual for the purpose of reproducing the drawings. Whenever it is desirable to include fold-over pages with the text in the front of the manual, such fold-over pages shall not be backed up with text or illustrations. All drawings which will be used for reference purposes while reading the text shall be provided with a blank section of the same size as a page at the left hand edge of the drawing (see figure 5). This will permit the drawing to be withdrawn clear of the manual while the text is being studied. Drawings shall be reproduced on a page the same height as other pages in the manual, in order that all folds will be parallel to the bound edge of the manual.

3.5.2.4 Text. -

3.5.2.4.1 Tables and charts. - The use of tables and charts is desirable. Such tables and charts shall not be elaborate or complicated, and sufficient explanation shall be given to make them easily understood.

3.5.2.4.2 Reference to figures. - Where reference is made to figures, the reference shall be to the figure number. The page number shall not be used except when the illustration is located more than three pages away from the reference. When reference is made to items shown on figures by index numbers, figure number and index number shall be indicated as follows: "Remote nut (7) and drive out bolt (8) (see figure 26).



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3.5.2.4.3 Numbers. - Numbers from one to nine, inclusive, appearing in the text for the purpose of stating quantities shall be spelled out. All other numbers shall be shown as numerals except when they are used at the beginning of a sentence, in which case they shall be spelled out and followed by the numeral in parenthesis.

3.5.2.4.4 Reference to materials. - All materials required for maintenance referred to in the manual, such as lubricants, sealing materials or abrasives, shall be described by Military specification numbers where applicable.

3.5.2.4.5 Illustrations. - Illustrations (including photographs, exploded views, drawings and sketches) shall be well planned and executed. They shall enable immediate and thorough comprehension of the subject.

3.5.2.4.5.1 Illustration identification. - Illustrations shall be identified by figure number and a title. Identifying figure numbers and titles shall be positioned immediately beneath the illustration. Whenever reduced size reproductions of drawings are used as illustrations, the drawing number shall be shown as well as the figure number.

3.5.2.4.5.2 Photographs. - Photographic illustrations shall be prepared with equipment capable of reproducing all details and shall show clearly the subject matter. Photographs shall be uniformly retouched to define shapes, accentuate details, and establish correct tone value of sufficient contrast for photolithographic reproduction.

3.5.2.4.5.3 Exploded views. - Exploded views may be used for showing the component parts of a subject. Well retouched photographs in which sharp contrast is incorporated to insure distinct detailed separation of parts may also be used for this purpose. It is preferable that all parts be exploded on their functional axis.

3.5.2.4.5.4 Drawings. - When drawings are necessary to illustrate the description, operation, and maintenance of the equipment or system, they shall be reduced in size as necessary (see figure 5), and reproduced in black and white. Each drawing shall be identified with the drawing number of the manufacturer and the bureau or agency concerned. Drawings shall be bound into the manual as shown on figure 5 (see also 3.5.2.3). Drawings shall normally be placed in the back of the manual but they must be inserted close to the references when practicable. Care shall be taken in the preparation of drawings for reproduction in the manual to insure that when the drawings are reduced in size they shall be clear and legible.

3.5.2.4.5.5 Sketches (see figure 8). - (NOTE: This paragraph does not pertain to reduced-size reproduction of standard approved drawings nor to portions of these drawings which may be extracted and used as illustrations in a manual.)

3.5.2.4.5.5.1 The rendering of sketches (airbrushing or line rendering) shall be done with the highest possible contrast. Adjoining areas of an illustration having similar values are to be avoided. Edges of all silhouette half-tone illustrations shall be sharply defined by retouching.

3.5.2.4.5.5.2 Exploded views and cutaway views shall be drawn in perspective to appear as realistic as possible without distortion. Isometric views may be used for small parts or units which lend themselves to this method without showing noticeable distortion.

3.5.2.4.5.5.3 Except for diagrams, schematics, orthographic projections, reproduction of approved drawings, all line sketches shall be prepared with the use of shading mediums to clarify and model the form of the sketch. This rendering shall be kept as simple as possible. Fuzzy freehand lines, rendering with fine lines, and cross hatching shall be avoided. Solid black shall be used in dark areas to increase contrast and simplify the sketch. This applies to cutaway views, exploded views and cross-section views.

3.5.2.4.5.6 Color. - Color shall be used functionally where necessary to show electric circuits, the flow of materials, schematic diagrams or operational diagrams. Unessential color shall not be used. Backgrounds of color tints may be used to clarify outline sketches, but color for decoration is not desired.

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3.5.2.4.6 Indexing and referencing of illustrations. -

3.5.2.4.6.1 Significant features or components of illustrations shall be identified by brief applicable nomenclature with arrows. Index numbers may be used on illustrations with explanatory legend under the sketch or photo only when an extremely large amount of nomenclature is required.

3.5.2.4.6.2 In order to assure a clear definition of lines where they pass through light and dark areas, arrows (leaders) shall be drawn in black with one edge outlined in white. The arrowhead, however, shall be completely outlined in white. The thickness of arrows shall be uniform and no greater than necessary to indicate clearly the desired details.

3.5.2.4.6.3 Index references and letterings (nomenclature) shall be planned to reproduce uniformly a size not less than 10-point type. Where index numbers are used, each illustration shall be handled independently with index numbers assigned consecutively, starting with number 1, except as specified in 3.5.1.9 (b), (c) and 3.5.1.9.2.3.

3.5.2.4.7 Printing. - Printing shall be done by either offset, lithograph or letterpress method, and shall be of equal quality to first-class commercial work. Copy may be type-set, varityped, or type-written with a standard typewriter. In general, type-set copy is preferred with varityped or type copy as second choice. The style of composition to be used, however, shall be governed by the quantity of manuals to be produced, the relative costs of the several methods and the availability of material prepared for earlier manuals. The contractor shall specify the method of composition to be used when manuscripts or sample copies are submitted for approval. The bureau or agency concerned may request data from the contractor to substantiate the method of composition chosen if deemed desirable.

3.5.2.4.7.1 Arrangement. - The text may be arranged in the form of either two vertical columns or a single wide column. The two-column arrangement shown on figures 4 and 7 is preferred; the single column arrangement is shown on figure 8. Right-hand margins shall not necessarily have lines flush at right, but care shall be taken to prepare a generally uniform margin. The size of the page shall be 8-1/2 by 11 inches. Text shall be reproduced on both sides of pages.

3.5.2.5 Paper. - The paper for photolithographic reproduction shall be preferably 25 by 38-60/500-basis litho-finish; for letterpress 25 by 38-70/500-basis dull-finish enamel stock.

3.5.2.6 Covers. - Covers for manuals less than 1/2 inch thick (less cover) shall be of the bellows fold type and of a black fabrikoid material. Covers for manuals over 1/2 inch in thickness shall be made of semiflexible board covered with a black fabrikoid material, weight 6-1/2 to 7-1/2 ounces per square yard (finished cloth). The covers shall be imprinted in gold, silver or aluminum color with the information shown on figure 1. Backbones of manuals over 1/2 inch in thickness shall be imprinted with the Navy identification (NAVSHIPS) number (see 3.3.1) and title in brief. Covers shall overlap the top, bottom, and right-hand edges of the manual by 3/16 inch. Outside corners of the covers shall be slightly rounded.

3.5.2.7 Binding. - The binding shall be looseleaf using three 3/16-inch metal posts and screws, spaced on 4-1/4 inch centers. Covers for manuals 1/2 inch thick or more shall have a binding flange of corrosion-resisting metal covered with 700 quality fabrikoid. On manuals containing less than 50 pages (25 sheets), split-type metallic fasteners with metallic washers may be used. All metal parts shall be of corrosion-resisting material, or shall be treated to resist corrosion. Should the addition of the parts list (see 3.5.1.9.1) to the manuals result in the final manual containing over 400 pages, the parts list shall be bound in a separate volume with appropriate reference on each volume as to the content of the other volume.

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3.6 Type C manuals. -

3.6.1 Contents. - Type C manuals shall contain the following information as applicable, presented in a logical arrangement (see figures 1 to 9, inclusive):

- (a) Title page (see figure 2).
- (b) General data (see 3.6.1.1).
- (c) Table of contents, listing all divisions and primary and secondary subdivisions (such as chapters or sections) with the corresponding page numbers.
- (d) List of illustrations and drawings, specifying titles, figure numbers and pages on which such illustrations appear.
- (e) Detailed description (see 3.6.1.2).
- (f) Installation instructions (see 3.6.1.3).
- (g) Adjustments and tests (see 3.6.1.4).
- (h) Operating instructions (see 3.6.1.5).
- (i) Maintenance (see 3.6.1.6).
- (j) Parts identification (see 3.6.1.7).
- (k) Drawings (see 3.6.1.8).

Note. - Although these requirements are directly applicable to manuals covering specific equipment, they shall be followed as closely as possible for manuals covering systems, such as engineering piping systems. When a manual covers a system or an equipment composed of several distinct units (for example, a generating set consisting of a Diesel engine, a generator, a voltage regulator, and a controller), it may be desirable to arrange the manual in major divisions, each covering one unit. If so, the major divisions may be arranged by subdivisions, each corresponding to the requirements herein.

3.6.1.1 General data. - This division shall contain data such as the following:

- (a) Safety notice (where high voltages or special hazards are involved) (see figure 9).
- (b) Component list containing:
  - Description of item.
  - Navy type designation.
  - Standard Navy stock number.
  - Dimensions.
  - Weight (with or without packing).
- (c) Input power requirements and heat dissipation.
- (d) Sallent design characteristics.
- (e) Electron tube complement.
- (f) Serial number (if appropriate).

3.6.1.2 Detailed description. - This division shall contain a complete detailed description of component assemblies and accessories which comprise the complete equipment; for example, in the case of a ship's service turbine generator set, the turbine, the gear, the generator, the exciter, and the voltage regulator. Allowable clearances, temperatures or tolerances, shall be shown in tabular form.

3.6.1.3 Installation instructions. - This division shall contain methods of installation, alignment, precautions, mounting instructions, recommendations, regarding shielding, grounding or bonding.

3.6.1.4 Adjustment and tests. - This division shall contain instructions for the adjustment and test of the system and its major components upon initial installation or under other conditions such as after major overhaul where complete system readjustment may be required.

3.6.1.5 Operating instructions. - This division shall contain simple, brief and effective instructions, including normal routines and precautions to be observed in starting, operating, and shutting-down the equipment. Where operations are to be performed in specified sequence, step-by-step procedure shall be used. Operations shall be numbered in the order in which they are to be performed. Operating data which is frequently referred to in operating the equipment shall be included in this division. Tables and charts shall be used for the presentation of these instructions where varying operating conditions are encountered.

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3.6.1.6 Maintenance. - This division shall cover all maintenance procedures and routine adjustments which should be performed periodically, as well as instructions for disassembly and replacement of worn or damaged parts. Instructions on lubrication shall be provided as applicable, preferably in chart form, and shall include the type of lubrication recommended by the manufacturer, together with specific time periods. Lubricants shall be described by Military specification numbers, where applicable and by commercial designations. Maintenance instructions shall cover the use of special tools.

3.6.1.7 Parts identification. - This division shall contain identification data covering all repair parts (parts and assemblies which are wearable or expendable during normal repair) to facilitate ready identification of parts for replacement and ordering purposes.

3.6.1.7.1 Parts list. - Parts shall be listed as follows:

- (a) Name of part.
- (b) Number required.
- (c) Actual manufacturer's name and service part number.
- (d) Standard Navy Stock Number assigned in accordance with Specification MIL-R-15137.

3.6.1.7.2 Parts illustrations. - A view of each assembly or subassembly or component parts shall be shown. Identification of illustrated parts shall be facilitated by the use of numbers which will identify all the parts in the parts list. Illustrations of the exploded type are preferable. When the use of exploded views is not practical, simple cross-sectional views may be used. The cross-sectional drawings when used for this purpose preferably shall be approved drawings or excerpts from approved drawings, and shall show both the manufacturer's drawing number and the drawing number of the bureau or agency concerned. In case no applicable approved drawing is available, cross-sectional views from manufacturer's drawings may be used.

3.6.1.8 Drawings. - This division shall contain reproductions of approved drawings, additional block diagrams, exploded views or explanatory drawings, as necessary to supplement the descriptive matter contained in the text. Wherever feasible, such diagrams, exploded views and sketches should be inserted in the text as close as possible to that portion of the text to which they apply. Diagrams of switches and relays used in the system showing the terminal numbering shall be inserted as additional drawings. The standard color codes for resistors and capacitors shall be stated, where applicable.

### 3.6.2 Format. -

3.6.2.1 Divisions (chapters or sections). - Division of manuals shall be chapters or sections, numbered or lettered consecutively. In general, chapters shall be the main divisions of larger manuals and sections shall be the main division of smaller manuals. Chapters shall be further divided into sections which shall be numbered or lettered consecutively within the chapter. Where chapters are used, the first page of each chapter shall be arranged as shown on figure 3.

### 3.6.2.2 Page identification and numbering. -

3.6.2.2.1 At the top of each left-hand page, flush with the outside margin, shall appear a briefed title of the manual. At the top of each right-hand page, flush with the outside margin, shall appear the division, chapter or section, number followed by its title. In some cases, it may be necessary to brief the title.

3.6.2.2.2 With the exception of fold-over pages and as otherwise specified herein, pages of the manuals shall be numbered consecutively in the bottom outside corner of each page, using Arabic numerals. The first page of chapter 1 or section 1 shall be page 1. All odd-numbered pages shall appear as right-hand pages. Fold-over pages shall be right-hand pages, and when they are used within the text they shall be assigned two page numbers, and the numbers shall be printed on the face of the sheet. Fold-over pages shall be arranged so that the page numbers are visible without unfolding. Fold-over arrangements are shown on figure 5.

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3.6.2.2.3 In manuals arranged for a system or equipment composed of several distinct units (see note under 3.6.1) the pages may be consecutively numbered within each chapter (or section), the first page of each chapter (or section) being page 1. In this case, the page number shall also include the chapter number. The chapter number shall appear first.

3.6.2.3 Layout treatment. - The layout of the manuals shall be such as to conserve space without detracting from the usability or clarity of material presented. Blank pages and spaces shall be avoided wherever possible. Textual material shall be printed on both sides of the page. Illustrations serving no instructional function or to which no reference is made in the text shall not be used. Partial page illustrations within the text are highly desirable. Several small illustrations may be grouped to form a single page layout. Wherever possible, illustrations shall be located so that reference can be made from applicable text without turning a page. Fold-over pages, double, or triple pages will be permitted only for illustrations where this procedure is essential to insure legibility. Fold-over pages shall be used primarily in the back of the manual for the purpose of reproducing the drawings. Whenever it is desirable to include fold-over pages with the text in the front of the manual, such fold-over pages shall not be backed up with text or illustrations. All drawings which will be used for reference purposes while reading the text shall be provided with a blank section of the same size as a page at the left-hand edge of the drawing (see figure 5). This will permit the drawing to be withdrawn clear of the manual while the text is being studied. Drawings shall be reproduced on a page the same height as other pages in the manual, in order that all folds will be parallel to the bound edge of the manual.

#### 3.6.2.4 Text. -

3.6.2.4.1 Tables and charts. - The use of tables and charts is desirable. Such tables and charts shall not be elaborate or complicated, and sufficient explanation shall be given to make them easily understood.

3.6.2.4.2 Reference to figures. - Where reference is made to figures, the reference shall be to the figure number. The page number shall not be used except when the illustration is located more than three pages away from the reference. When reference is made to items shown on figures by index numbers, figure number and index number shall be indicated as follows: "Remove nut (7) and drive out bolt (8) (see figure 26).

3.6.2.4.3 Numbers. - Numbers from one to nine, inclusive, appearing in the text for the purpose of stating quantities shall be spelled out. All other numbers shall be shown as numerals except when they are used at the beginning of a sentence, in which case they shall be spelled out and followed by the numeral in parenthesis.

3.6.2.4.4 Reference to materials. - All materials required for maintenance referred to in the manual, such as lubricants, sealing materials or abrasives, shall be described by Military specification numbers where applicable.

3.6.2.4.5 Illustrations. - Illustrations (including photographs, exploded views, drawings and sketches) shall be well planned and executed. They shall enable immediate and thorough comprehension of the subject.

3.6.2.4.5.1 Illustration identification. - Illustrations shall be identified by figure number and a title. Identifying figure numbers and titles shall be positioned immediately beneath the illustration. Whenever reduced size reproductions of drawings are used as illustrations, the drawing number shall be shown as well as the figure number.

3.6.2.4.5.2 Photographs. - Photographic illustrations shall be prepared with equipment capable of reproducing all details and shall show clearly the subject matter. Photographs shall be uniformly retouched to define shapes, accentuate details, and establish correct tone value of sufficient contrast for photolithographic reproduction.

3.6.2.4.5.3 Exploded views. - Exploded views may be used for showing the component parts of a subject. Well retouched photographs in which sharp contrast is incorporated to insure distinct detailed separation of parts may also be used for this purpose. It is preferable that all parts be exploded on their functional axis.



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3.6.2.4.5.4 Drawings. - When drawings are necessary to illustrate the description, operation, and maintenance of the equipment or system, they shall be reduced in size as necessary (see figure 5), and reproduced in black and white. Each drawing shall be identified with the drawing number of the manufacturer and the bureau or agency concerned. Drawings shall be bound into the manual as shown on figure 5 (see also 3.6.2.3). Drawings shall normally be placed in the back of the manual but they may be inserted close to the references when practicable. Care shall be taken in the preparation of drawings for reproduction in the manual to insure that when the drawings are reduced in size they shall be clear and legible.

3.6.2.4.5.5 Sketches (see figure 6). - (NOTE: This paragraph does not pertain to reduced-size reproduction of standard approved drawings nor to portions to these drawings which may be extracted and used as illustrations in a manual.)

3.6.2.4.5.5.1 The rendering of sketches (airbrushing or line rendering) shall be done with the highest possible contrast. Adjoining areas of an illustration having similar values are to be avoided. Edges of all silhouette half-tone illustrations shall be sharply defined by retouching.

3.6.2.4.5.5.2 Exploded views and cutaway views shall be drawn in perspective to appear as realistic as possible without distortion. Isometric views may be used for small parts or units which lend themselves to this method without showing noticeable distortion.

3.6.2.4.5.5.3 Except for diagrams, schematics, orthographic projections, reproductions of approved drawings, all line sketches shall be prepared with the use of shading mediums to clarify and model the form of the sketch. This rendering shall be kept as simple as possible. Fuzzy freehand lines, rendering with fine lines, and cross hatching shall be avoided. Solid black shall be used in dark areas to increase contrast and simplify the sketch. This applies to cutaway views, exploded views and cross-section views.

3.6.2.4.6 Indexing and referencing of illustrations. -

3.6.2.4.6.1 Significant features or components of illustrations shall be identified by brief applicable nomenclature with arrows. Index numbers may be used on illustrations with explanatory legend under the sketch or photo only when an extremely large amount of nomenclature is required.

3.6.2.4.6.2 In order to assure a clear definition of lines where they pass through light and dark areas, arrows (leaders) shall be drawn in black with one edge outlined in white. The arrowhead, however, shall be completely outlined in white. The thickness of arrows shall be uniform and no greater than necessary to indicate clearly the desired details.

3.6.2.4.6.3 Index references and letterings (nomenclature) shall be planned to reproduce uniformly a size not less than 10-point type. Where index numbers are used, each illustration shall be handled independently with index numbers assigned consecutively, starting with number 1.

3.6.2.4.7 Printing. - Printing shall be done by either offset, lithograph or letterpress method, and shall be of equal quality to first-class commercial work. Copy may be type-set, varityped, or typewritten with a standard typewriter. In general, type-set copy is preferred with varityped or type copy as second choice. The style of composition to be used, however, shall be governed by the quantity of manuals to be produced, the relative costs of the several methods, the availability of material prepared for earlier manuals. The contractor shall specify the method of composition to be used when manuscripts or sample copies are submitted for approval. The bureau or agency concerned may request data from the contractor to substantiate the method of composition chosen if deemed desirable.

3.6.2.4.7.1 Arrangement. - The text may be arranged in the form of either two vertical columns or a single wide column. The two-column arrangement shown on figures 4 and 7 is preferred; the single column arrangement is shown on figure 8. Right-hand margins shall not necessarily have lines flush at right, but care shall be taken to prepare a generally uniform margin. The size of the page shall be 8-1/2 by 11 inches. Text shall be reproduced on both sides of pages.

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3.6.2.5 Paper. - The paper for photolithographic reproduction shall be preferably 25 by 38-60/500-basis litho-finish; for letterpress 25 by 38-70/500-basis dull-finish enamel stock.

3.6.2.6 Covers. - Covers for manuals less than 1/2 inch thick (less cover) shall be of the bellows fold type and of a black fabrikoid material. Covers for manuals over 1/2 inch in thickness shall be made of semiflexible board covered with a black fabrikoid material, weight 6-1/2 to 7-1/2 ounces per square yard (finished cloth). The covers shall be imprinted in gold, silver or aluminum color with the information shown on figure 1. Backbones of manuals over 1/2 inch in thickness shall be imprinted with the Navy identification (NAVSHIPS) number (see 3.3.1) and title in brief. Covers shall overlap the top, bottom, and right-hand edges of the manual by 3/16 inch. Outside corners of covers shall be slightly rounded.

3.6.2.7 Binding. - The binding shall be looseleaf using three 3/16-inch metal posts and screws spaced on 4-1/4 inch centers. Covers for manuals 1/2 inch thick or more shall have a binding flange of corrosion-resisting metal covered with 700 quality fabrikoid. On manuals containing less than 50 pages (25 sheets), split-type metallic fasteners with metallic washers may be used. All metal parts shall be of corrosion-resisting material, or shall be treated to resist corrosion. Should the addition of the parts list (see 3.6.1.7.1) to the manual result in the final manual containing over 400 pages, the parts list shall be bound in a separate volume with appropriate reference on each volume as to the content of the other volume.

### 3.7 Type D manuals. -

3.7.1 Contents. - Type D manuals shall consist of manufacturer's standard commercial instructions and parts lists bound together.

### 3.7.2 Format. -

3.7.2.1 Covers. - Covers shall be of a dark color fabrikoid material. The cover shall show name and model of the equipment, manufacturer's name and address, Navy contract or order number and Navy NAVSHIPS identification number. Printing shall be of a light contrasting color. Covers shall be 8-1/2 by 11 inches for all manuals of that size or smaller (see figure 1).

3.7.2.2 Binding. - The manuals and covers shall be bound either by stapling, stitching or by use of metal binding posts.

3.8 Workmanship. - The workmanship shall be of high quality comparable in text compilation, arrangement, and accuracy to high-grade commercial manuals and parts catalogs. Copy which has filled letters or is blurred will not be acceptable. The workmanship shall be satisfactory to the bureau or agency concerned.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 The methods of approval are specified in section 3.

4.2 Inspection procedures. - For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

## 5. PREPARATION FOR DELIVERY

### 5.1 Packaging for domestic and overseas shipment. -

5.1.1 All manuals shall be packaged individually consistent with good commercial practice so as to ensure that they are kept dry and clean.

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5.2 Packing. -

5.2.1 Equipment manuals for domestic and overseas shipment. - Two copies of the manual shall be packed within the shipping container holding the main unit of equipment.

5.2.2 Bulk manuals. -

5.2.2.1 For domestic shipment. - Manuals packaged as specified in 5.1.1 shall be packed in shipping containers suitable to method of shipment used and in conformance with good commercial practice. The gross weight of the container shall not exceed 200 pounds.

5.2.2.2 For overseas shipment. - Manuals packaged as specified in 5.1.1 shall be packed in shipping containers which are so lined as to preserve the manuals from water damage and dampness in conformance with good commercial practice. The shipping containers shall be so closed or strapped as to give additional strength necessary to prevent collapsing during shipment. The gross weight of wood boxes shall not exceed 150 pounds; of fiberboard boxes, 70 pounds.

## 6. NOTES

6.1 Ordering data. -

6.1.1 Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) Quantity of manuals required (see 3.2).
- (d) Requirements for type A (see 3.3).
- (e) Details of special requirements for drawings, charts and illustrations, pertinent to the particular equipment, if not covered by the equipment specification.
- (f) Security classification, if required (see 3.4.4).
- (g) Whether the manuals are to be packed and marked for domestic or overseas shipment (see 5.1 and 5.2).

6.2 Figures 1 through 5b inclusive have been marked "CONFIDENTIAL" for demonstration purposes only.

Patent notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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## FIGURE 1 - TYPICAL COVER.

BUREAU OR AGENCY IDENTIFICATION AND NUMBER OF MANUAL appears in upper left-hand corner, set in 18 pt. Stymie light caps with Stymie bold numerals.

SECURITY CLASSIFICATION (see 3.3.4) appears in upper left-hand corner, set in 18 pt. Stymie light caps. (Security Classification in this case is "Confidential".)

TYPE OF MANUAL set in 24 pt. Stymie extra bold upper and lower case.

SPECIFIC TITLE OF MANUAL set in 30 pt. Stymie extra bold caps.

MANUFACTURER'S NAME AND ADDRESS

MANUFACTURER'S CONTRACT NUMBER TO be set under Manufacturer's name as shown, in 18 pt. Stymie light, upper and lower case.

MANUFACTURER'S BOOK NUMBER OR IDENTIFICATION

NAME OF BUREAU, NAVY DEPARTMENT, WASHINGTON, D.C., to be set at bottom page in 12 pt. Stymie light caps, letter spaced and separated as shown.

SECURITY CLASSIFICATION (see 3.3.4) appears in lower right-hand corner, set in 18 pt. Stymie light caps. (Security Classification in this case is "Confidential".)

NOTE - If Stymie is not available, the following faces may be substituted in this order: Beton, Girder, Futura and Kabel, Weights shown shall be maintained.

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(This figure is marked Confidential for demonstration purposes only.)

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NAVSHIPS 000-0000

CONFIDENTIAL

TECHNICAL MANUAL

450-KW AC/DC

GENERATOR SET

STEAM-TURBINE

MANUFACTURER'S NAME, AND  
ADDRESS

Contract NObs-0000

MANUFACTURER'S BOOK NUMBER

BUREAU OF SHIPS - NAVY DEPARTMENT - WASHINGTON, D. C.

CONFIDENTIAL



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## FIGURE 2 - TYPICAL TITLE PAGE.

SECURITY CLASSIFICATION (see 3.3.4) appears in upper right-hand corner set in 18 pt. Stymie light caps. (Security classification in this case is "Confidential".)

BUREAU OR AGENCY IDENTIFICATION AND NUMBER OF MANUAL appears in upper right corner, set in 18 pt. Stymie light caps with Stymie bold numerals.

TYPE OF MANUAL set in 24 pt. Stymie extra bold upper and lower case.

SPECIFIC TITLE OF MANUAL set in 30 pt. Stymie extra bold caps.

APPLICABLE VESSELS (when appropriate) to be set under title of manual, as shown, in 18 pt. Stymie light, upper and lower case. "WARNING" paragraph shall be set 8 pt. Stymie bold, upper and lower case (see 3.3.4).

MANUFACTURER'S NAME AND ADDRESS

MANUFACTURER'S CONTRACT NUMBER to be set under Manufacturer's Name and address as shown in 18 pt. Stymie light, upper and lower case.

MANUFACTURER'S BOOK NUMBER OR IDENTIFICATION

DATE OF MANUAL to be included at the lower right of page.

SECURITY CLASSIFICATION (see 3.3.4) appears in lower right-hand corner, set in 18 pt. Stymie light caps with Stymie bold numerals.

(This figure is marked Confidential for demonstration purposes only.)

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CONFIDENTIAL

NAVSHIPS 000-0000

TECHNICAL MANUAL

450-KW AC/DC

GENERATOR SET

STEAM-TURBINE

CL-55 CLASS

WARNING: This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794. The transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

MANUFACTURER'S NAME, AND  
ADDRESS

Contract NObs-0000

MANUFACTURER'S BOOK NUMBER

BUREAU OF SHIPS - NAVY DEPARTMENT - NOVEMBER 1952

CONFIDENTIAL

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FIGURE 3 - TYPICAL CONTENTS PAGE

SECURITY CLASSIFICATION (see 3.3.4) appears in upper right-hand corner set in 12 pt. Futura bold caps. (Security Classification in this case is "Confidential".)

CHAPTER TITLE to appear in upper right-hand corner set in 18 pt. Futura bold caps.

CHAPTER AND NUMBER to be set in 30 pt. Stymie light, upper and lower case.

"DETAILED DESCRIPTION" to be set in 14 pt. Stymie light caps.

"LIST OF SECTIONS" and "PAGE NO." to be set in 10 pt. Stymie light caps.

THE LISTING OF SECTIONS (number, name, and page) to be set in 14 pt. Futura bold, upper and lower case. All of the above materials is to be set as close as possible in style to that shown with sufficient leading and with the whole text block centered between the rules.

FOLIO NUMBER to appear on trim edge and bottom and to be set in 12 pt. Futura bold.

SECURITY CLASSIFICATION to appear on right-hand side at the bottom and to be set in 12 pt. Futura bold caps.

NOTE.- Girder or Beton light or medium may be substituted for Stymie. Any other Sans Serif type of same weight may be substituted for Futura.

(This figure is marked Confidential for demonstration purposes only.)

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CONFIDENTIAL  
DETAILED DESCRIPTION

Chapter 2

DETAILED DESCRIPTION

LIST OF SECTIONS

PAGE NO.

1 Turbine	22
2 Speed Reducing Gear	23
3 Oil System	24
4 AC Generator	26
5 DC Generator	29
6 Voltage Regulator Equipment	32
7 Air Circuit Breaker	40

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CONFIDENTIAL

Title of Manual - Upper corner left-hand pages  
14 pt. Futura medium caps.

## 450 - KW AC/DC GENERATOR SET, STEAM-TURBINE

## SECTION 1

1 pica

## Description of Turbine

(Give complete name plate data as part of the title of description of turbine, reduction, etc.)

The general arrangement of the set is shown in Fig. 4. The turbine and pinion shafts are rigidly connected and supported by three bearings, two in the reduction-gear casing and one at the exhaust end of the turbine.

Primary Subheads—14 pt. Futura extra bold caps centered. **ROTOR**

The bucket wheels, shaft, coupling flange, and balancing rings are all integral, being machined from a solid alloy steel forging. The pinion is bolted on one end of the turbine rotor and the emergency governor on the other. The rotor, complete with buckets, is balanced statically and dynamically at the factory.

1 pica

**Balancing Rings**

6 pt. space

The coupling flange of the rotor is tapped on its outer periphery for radial balancing plugs. See photograph below. At the exhaust end, the shaft carries another integrally forged balancing ring, tapped for axial balancing plugs.

18 pt. Styvie medium caps.

18 pt. Styvie medium upper and lower case.

**DYNAMIC BALANCING.** Adjustment of the rotor for dynamic balance is accomplished by the insertion at the proper points in these rings of balancing plugs of the correct weight. The plugs, when threaded into their holes, are drawn flush with the outer shoulder, and the outer thread of the hole is staked over. See Fig. 31, page 26, for generator balancing rings.

All of the holes are filled initially with one-half inch screw plugs to minimize windage loss, and the balancing plugs are substituted where necessary. These plugs provide an accessible means of balancing when rebucketing the rotor. During inspection periods it is advisable to inspect all plugs to see that they are tight.

**Buckets**

The buckets on all the wheels are of corrosion-resisting steel, and are attached by T-head dovetails. The buckets are spaced by skirts at the dovetail, machined as an integral part. The buckets are banded together in sections by steel shroud bands riveted onto the buckets.

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## FIGURE 4. TYPICAL TEXT PAGE

A typical text page spread is shown here with type and spacing specifications noted. New sections may be started near the bottom of the page if the space allows a minimum of three lines of type in each column; tabulated matter may be run two columns or one column.

Fig. 4.- Turbo-generator set as seen from turbine end, throttle-valve side

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Futura bold caps.

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Chapter Heading—Upper right-hand corner  
of right-hand pages, 14  
pt. Futura medium caps.

## DETAILED DESCRIPTION

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A shroud band of corrosion-resisting steel extends completely around the outer circumference of the buckets on each wheel. This band closes over the tops of the buckets and, by projecting slightly on each side of the buckets, aids in preventing steam leakage over the tops of the wheels.

The low-pressure end of the rotor carries an emergency governor assembly. The housing of the assembly is machined to receive a ratchet wrench for turning the rotor by hand. A wrench for this purpose is furnished with the units.

## NOZZLE PLATE

The cast steel first-stage nozzle plate (3), Fig. 2, is bolted to and caked in the upper half of the high-pressure head. The nozzle plate contains a series of

reamed nozzles opening into ports on the high-pressure side.

## Nozzle Diaphragms

The five nozzle diaphragms are made of steel with welded corrosion-resisting steel nozzle partitions.

Secondary Subheads—14 pt. Futura extra  
Mounting bold upper and lower  
case, flush left.

Because of the high steam temperature at the inlet end of the casing, the second-stage diaphragm is supported at the center line to allow for radial expansion.

SECOND-STAGE DIAPHRAGM. The lower half of the second-stage diaphragm is further positioned by the centering dowel (7) in the bottom of the casing. Crush pins (4) around the periphery of the diaphragm assist in holding both halves securely in place.

2½ picas

## SECTION. 2

## Description of Speed Reducing Gear

2 picas

The reducing gear is the single-reduction, single-helical type, and reduces the turbine speed of 10,039 r. p. m. to the generator speed of 1,200 r. p. m.

## PINION

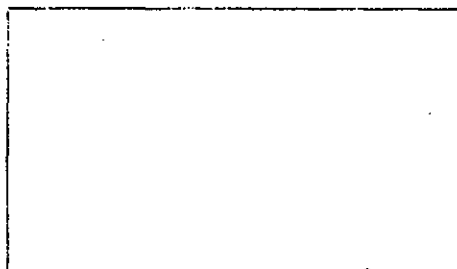
The pinion is forged integral with the shaft. One end of the shaft is provided with a flange that bolts rigidly to the turbine shaft and through which one end of the turbine rotor is supported. The other end of the pinion shaft has an extension, on which is assembled the thrust bearing. The complete assembly is shown in Fig. 6.

## GEAR WHEEL

The gear wheel is a steel forging and is pressed and keyed on a forged steel shaft. One end of the gear shaft is solidly coupled to the generator shaft, and part of the weight of the generator rotor is carried by the gear bearing at that end. The turbine end of this shaft is extended to carry the spiral gear that drives the oil pump and the governor.

## GEAR CASING

The gear casing consists of two halves which are jointed at the horizontal center line of the rotors. The bearing seats for supporting the gear and pinion bearings, the oil pump seating, and the supports for the high-pressure end of the turbine are fabricated integral with the lower half of the casing.



8 pt. space

FIG. 5—View of the pinion showing half of the solid coupling, which is bolted to the turbine rotor

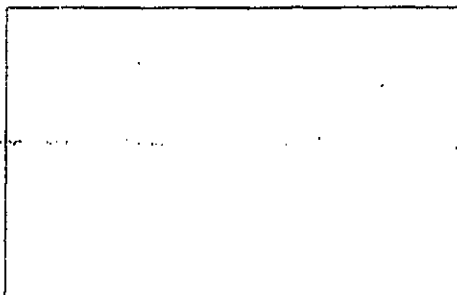


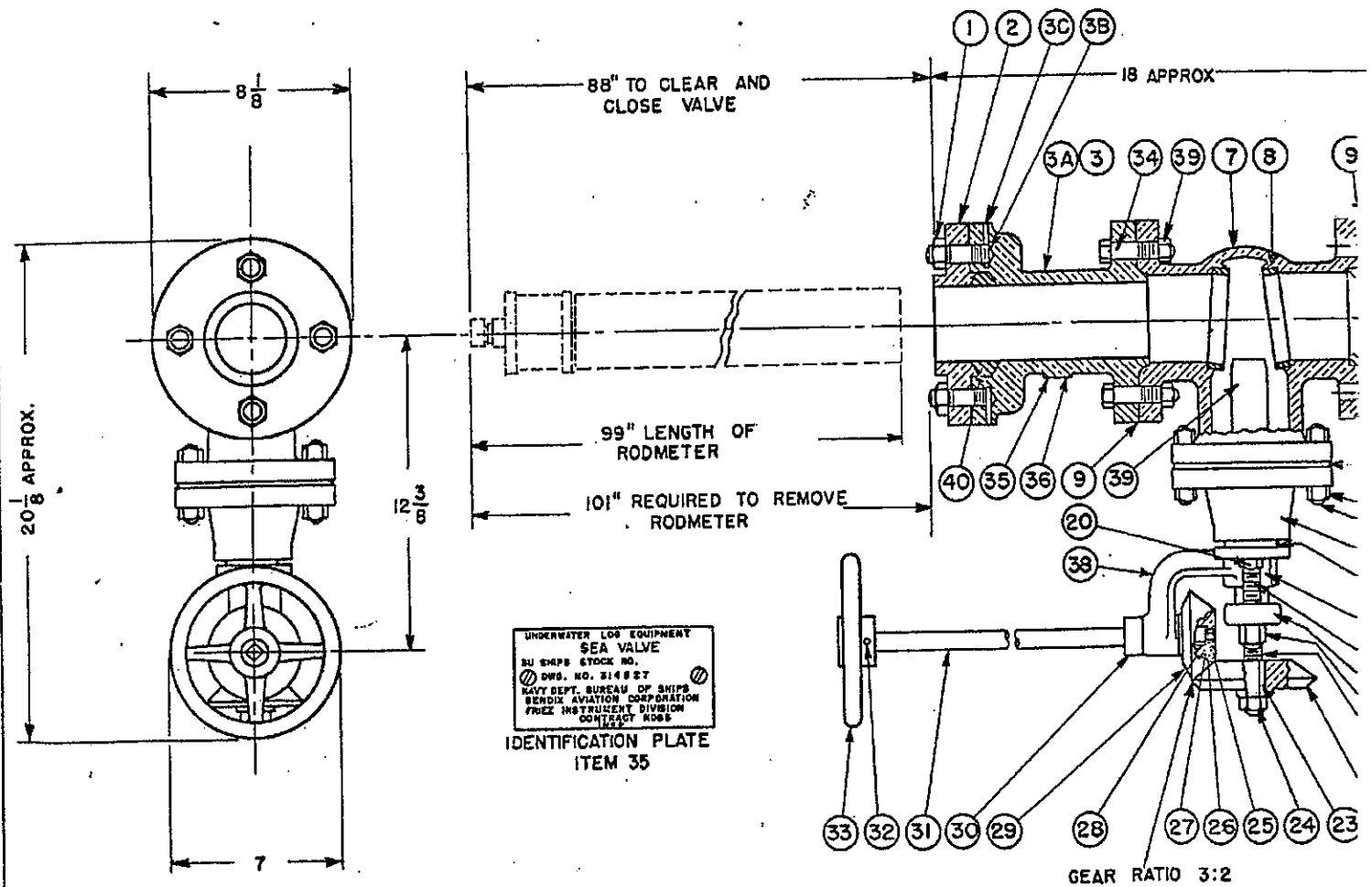
FIG. 6—Reducing gear with upper half casing removed showing the pinion and gear wheel assembled in their operating positions Captions—Italic of text.

Folio—Outer bottom corner, 12 pt.

CONFIDENTIAL

(This figure is marked Confidential  
for demonstration purposes only.)

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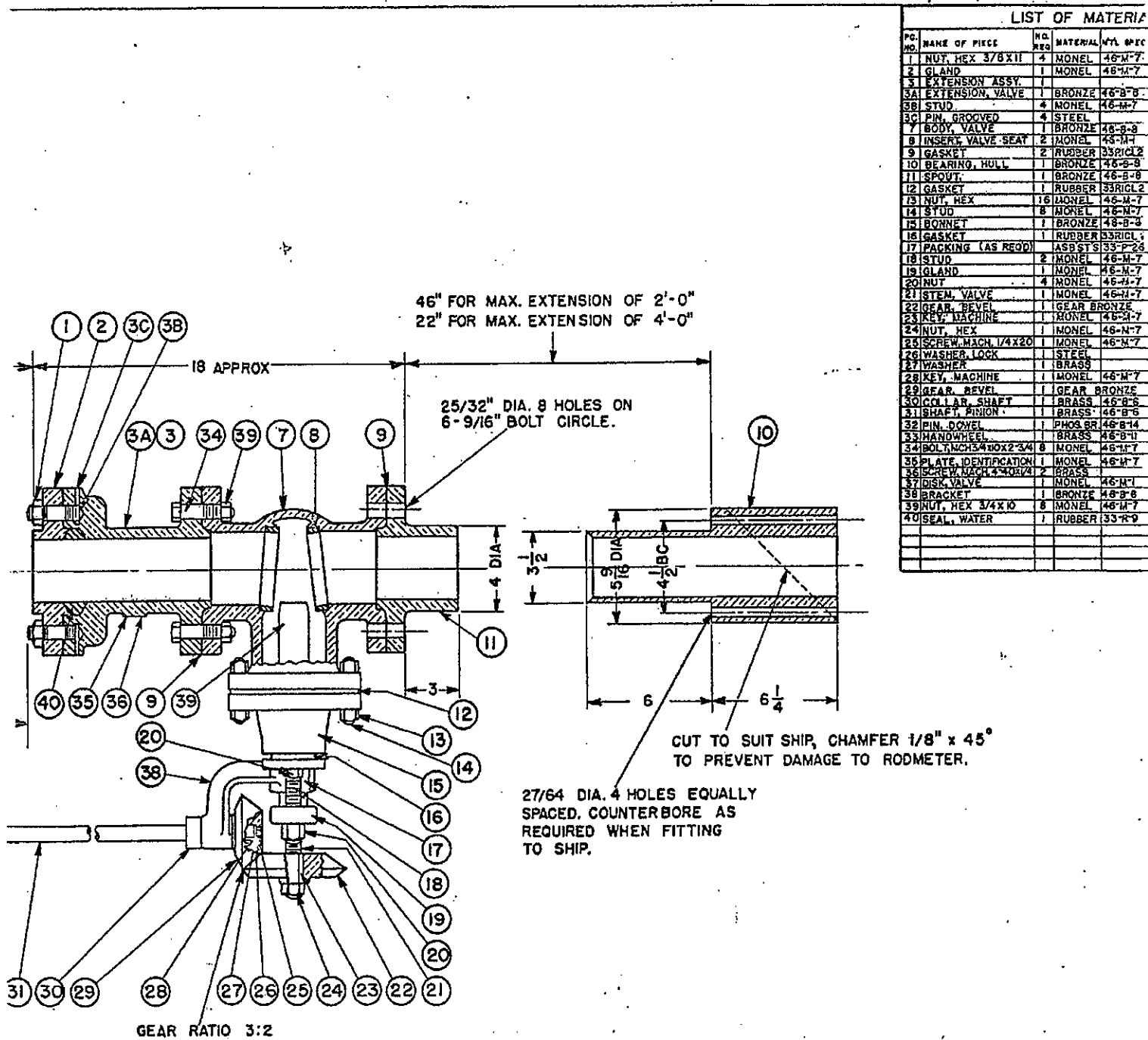


Figure 5a

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LIST OF MATERIAL QUANTITIES FOR ONE SEA VALVE											REVISIONS			
PC. NO.	NAME OF PIECE	QTY.	MATERIAL	W/L SPEC	CONTRACTOR	MANUFACTURER	BU SHIPS	STD NAVY	REMARKS	REV. NO.	DESCRIPTION	MFR.	QTY.	DATE
1	NUT, HEX 3/8x11	4	MONEL	46-M-7	34738-A									
2	GLAND	1	MONEL	46-M-7	34746-A									
3	EXTENSION ASSY.	1			34743-A									
3A	EXTENSION, VALVE	1	BRONZE	46-B-8	34745-A									
3B	STUD	4	MONEL	46-M-7	34735-A									
5	PIN, GROOVED	4	STEEL											
7	BODY, VALVE	1	BRONZE	46-B-8	34734-A				ZINC PLATE					
8	INSERT VALVE SEAT	2	MONEL	46-M-7										
9	GASKET	2	RUBBER	33RCL2	34739-A									
10	BEARING, HULL	1	BRONZE	46-B-8	34741-A									
11	SPOUT	1	BRONZE	46-B-8	34742-A									
12	GASKET	1	RUBBER	33RCL2										
13	NUT, HEX	16	MONEL	46-M-7										
14	STUD	8	MONEL	46-M-7										
15	BONNET	1	BRONZE	46-B-8										
16	GASKET	1	RUBBER	33RCL2										
17	PACKING (AS REQD)	1	ASBEST	33-P-28					SYMBOL NO4					
18	STUD	2	MONEL	46-M-7										
19	GLAND	1	MONEL	46-M-7										
20	NUT	4	MONEL	46-M-7										
21	STEM, VALVE	1	MONEL	46-M-7										
22	GEAR, REVEL	1	GEAR BRONZE						P.D. 5 NY 30					
23	KEY, MACHINE	1	MONEL	46-M-7										
24	NUT, HEX	1	MONEL	46-M-7										
25	SCREW, MACH, 1/4x20	1	MONEL	46-M-7										
26	WASHER, LOCK	1	STEEL						ZINC PLATE					
27	WASHER	1	BRASS											
28	KEY, MACHINE	1	MONEL	46-M-7										
29	GEAR, REVEL	1	GEAR BRONZE						P.D. 3333 NY.20					
30	COLLAR, SHAFT	1	BRASS	46-B-8										
31	SHAFT, PINION	1	BRASS	46-B-8										
32	PIN, DOWEL	1	PHOS BR	46-B-14										
33	HANDWHEEL	1	BRASS	46-B-11										
34	BOLT, MCH 3/4x2-3/4	8	MONEL	46-M-7	34737-A									
35	PLATE, IDENTIFICATION	1	MONEL	46-M-7	34736-A									
36	SCREW, MACH, 4x20x1/4	2	BRASS											
37	DISK, VALVE	1	MONEL	46-M-7										
38	BRACKET	1	BRONZE	46-B-8										
39	NUT, HEX 3/4x10	8	MONEL	46-M-7	34738-2-A									
40	SEAL, WATER	1	RUBBER	33-R-9	34740-A									

## NOTES:

1. Pinion shaft, item 31, is furnished 56" long (from center line of valve) length to be cut to suit ship and handwheel pinned in place. Necessary bearing for shaft to be furnished by others.
2. At installation, item 10 and 11 must be rigidly held in alignment.
3. Where spec. no. is not noted, material of best commercial grade to be used.
4. Valve made in accordance with Navy Spec. 45-V-17 class III except as noted.
5. Components exposed to hydrostatic pressure shall withstand without damage or operational failure hydrostatic pressure of 550 lbs. per square inch for one hour.

CHAMFER 1/8" x 45°  
 1/16" TO RODMETER.

DRAWN BY CHECKED BY CHIEF DRAFT APP'D BY APP'D DATE SIGN'TR. TITLE	<b>MASTER PLAN</b> <b>UNDERWATER LOG</b> <b>EQUIPMENT</b> (IMPELLER TYPE) <b>SEA-VALVE ASSEMBLY</b> BU SHIPS STOCK NO. STD. NAVY STOCK NO. SCALE 8"=1' (UNIT WT. 225 LBS.)	BENDIX AVIATION CORPORATION PRICE INSTRUMENT DIVISION BALTIMORE, MARYLAND DIST. NO. 814217 NAVY DEPT. BU SHIPS CONTRACT NO. 4776.6 BU SHIPS NO. 1008716
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CONFIDENTIAL

## MODEL GSB-8 DIESEL ENGINE

FIGURE 5. TYPICAL GATEFOLD  
OR FOLD-IN PAGES

The following two pages illustrate correct style that may be followed in gatefold pages where oversize illustrations of blueprints are to be used. Fold-over pages, double, or triple pages will be permitted only for illustrations where essential to insure legibility.

## ENGINE THROTTLE CONTROL

## DESCRIPTION

The engine throttle control system is made up of a series of linkages which, in direct connection with a hydraulic system, enable the operator to start and operate the engine at any required speed. (Fig. 3.) For complete understanding the following description is essential:

1. A mechanical linkage sets the limit to which fuel can be injected.
2. The engine throttle control sets the operating fuel pressure of the fuel pump.
3. A mechanical linkage from the control governor operates the control shaft which is coupled to the fuel injectors.
4. The hydraulic system, in conjunction with the linkage system, operates the control governor regulator shaft.
5. The throttle control operates the limit switch which controls the electrical circuit of the brake on the propeller shaft, just aft of the reduction gear.

The engine throttle control system is actuated by the movement of the throttle lever, or handle, of the hydraulic transmitter, which is located on the after side of the engine control box. (Fig. 1.) When the throttle lever is in the extreme out position, the hydraulic transmitter and receiver units are synchronized. (This function will be explained in detail later in this section.)

As the throttle handle is moved inward, beyond the synchronizing stage, it reaches the point where, for a few degrees of travel, it operates the air starting system (Section 20). When the air starting system is functioning, no fuel is admitted into the cylinders; however, at the instant when the throttle handle is moved farther inward and the air starting valve is released, fuel oil is

then injected into the cylinders, and the engine begins to operate under its own power. Continuing the inward movement of the throttle handle increases the amount of fuel oil which is injected into the cylinders, and thereby increases the speed and power of the engine (Section 4).

The serrated shaft of the transmitter is linked with the throttle shaft which, in turn, is directly linked with the throttle lever tube. The throttle shaft is supported in two bronze bearings which are bolted to pads on the cylinder block, just below the camshaft trough. (Fig. 3.)

The throttle lever tube floats on the control shaft, and a lever attached to it is connected with the regulating adjusting lever of the fuel oil pump. A spring loaded piston and cylinder assembly is built into the regulating adjusting lever, and its function is to permit the throttle shaft to pass through the synchronizing and air starting stages without moving the fuel pump pressure regulating lever. This permits the regulating lever to be moved from its idling position to maximum engine load position. A pin lever, welded to the throttle lever tube, sets a position beyond which the control lever on the control shaft cannot advance. Therefore, the control lever cannot be advanced beyond the throttle setting, and no additional fuel oil will be injected into the cylinders until the throttle is advanced farther. The control lever rides on the pin lever of the throttle lever tube, unless the automatic function of the governor tends to hold it away from the pin lever.

The two fuel injectors are synchronized and are coupled by the intermediate control shaft. The after fuel injector is coupled to the control shaft, which is supported at the opposite end by a ball bearing in a bracket attached to the camshaft gear cover.

CONFIDENTIAL

(This figure is marked Confidential  
for demonstration purposes only.)



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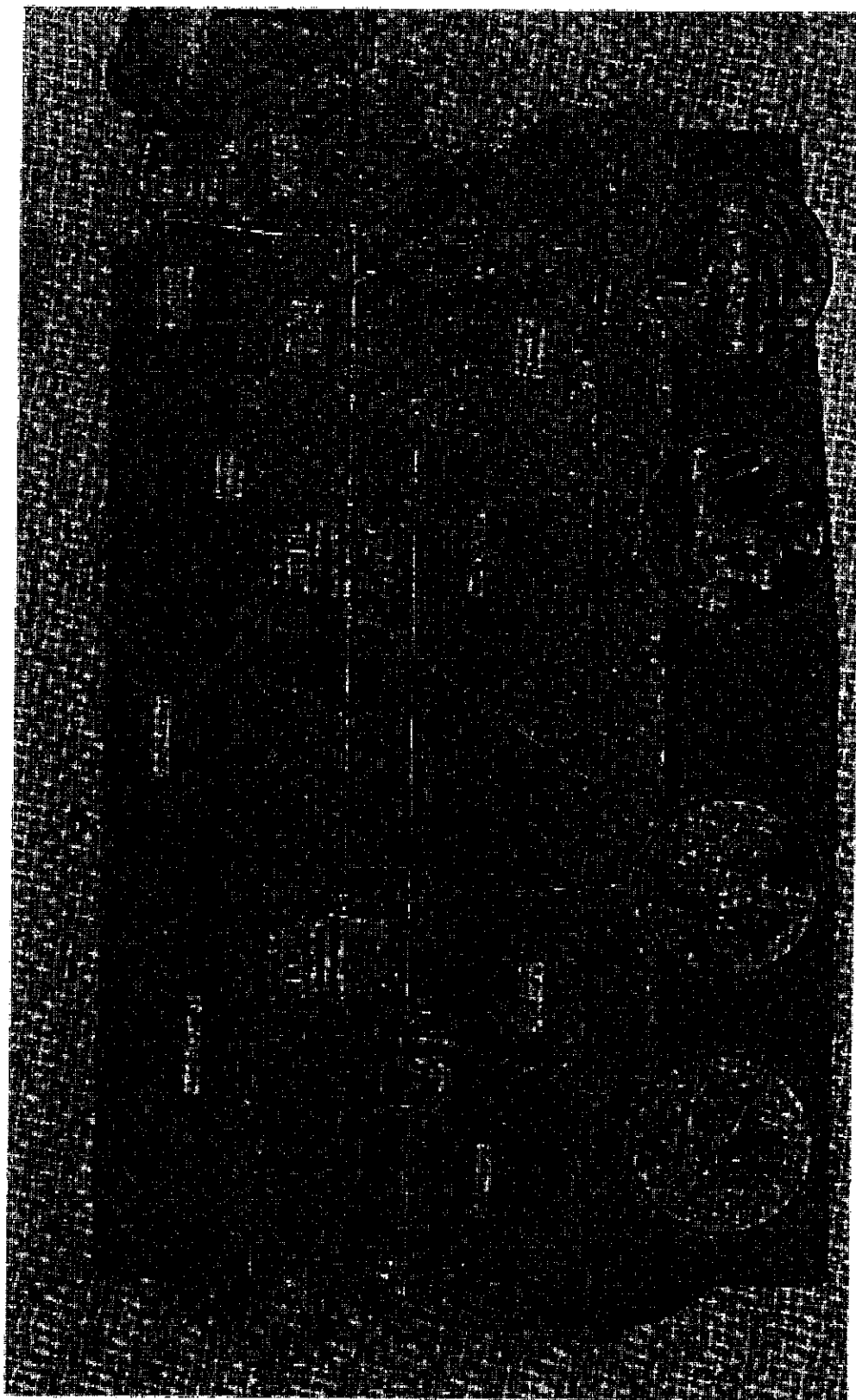


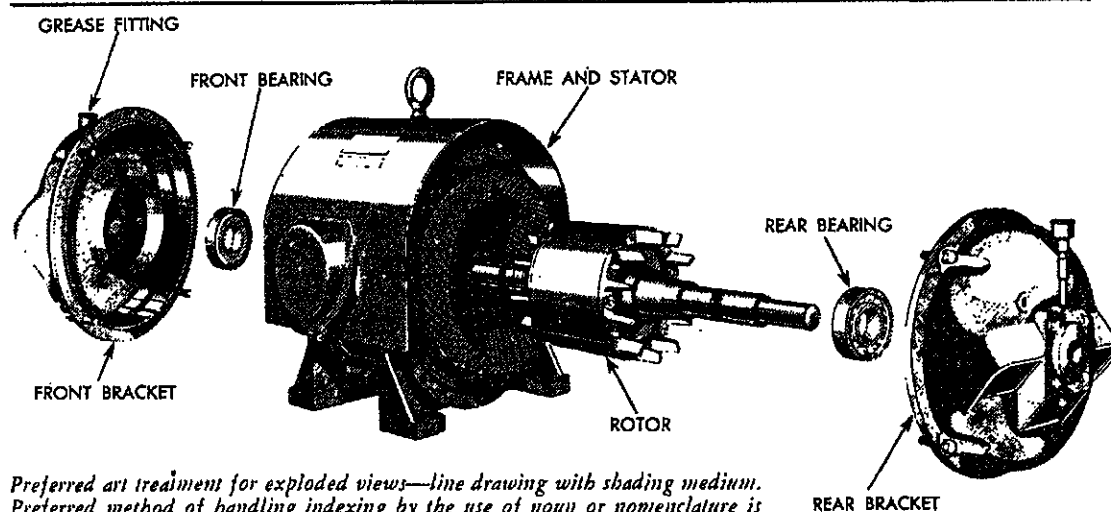
Figure Eb. - Engine Control System.

(This figure is marked confidential for demonstration purposes only.)

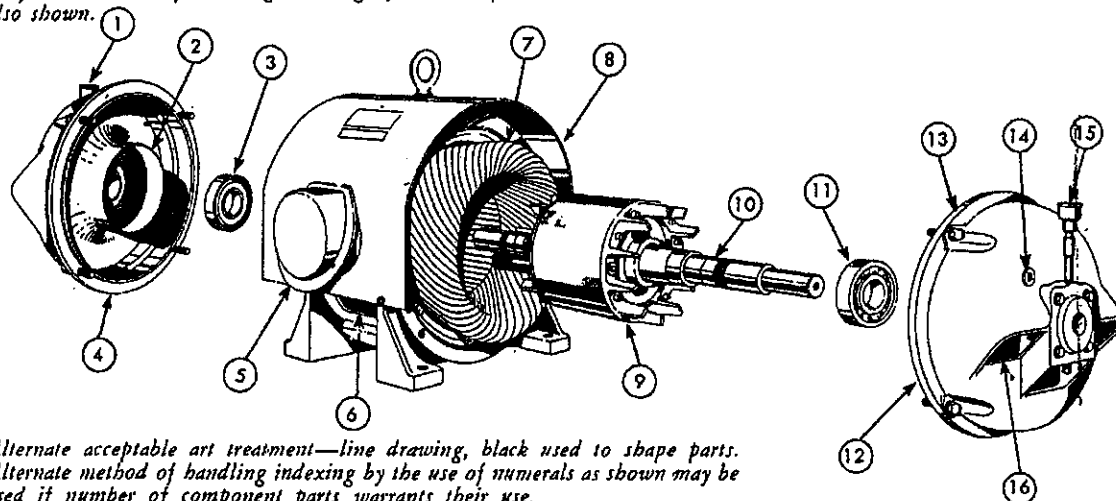
CONFIDENTIAL

9999906 2107226 6T2

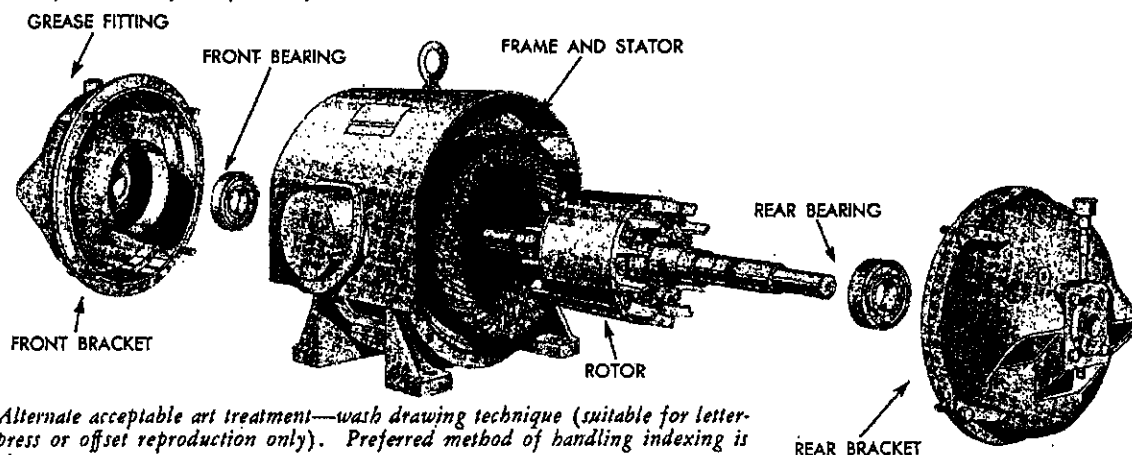
## ART TREATMENT FOR EXPLODED VIEWS



Preferred art treatment for exploded views—line drawing with shading medium. Preferred method of handling indexing by the use of noun or nomenclature is also shown.



Alternate acceptable art treatment—line drawing, black used to shape parts. Alternate method of handling indexing by the use of numerals as shown may be used if number of component parts warrants their use.



Alternate acceptable art treatment—wash drawing technique (suitable for letterpress or offset reproduction only). Preferred method of handling indexing is shown.

NOTE.—Where letterpress or offset reproduction is to be employed, well-retouched photographs, exploded as per drawing shown above will also be acceptable.

Figure 6.

■ 9999906 2107227 539 ■

## FIGURES 7 AND 8

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These figures show approved style to be followed on manuals which are to be type-written, varityped, or set with the electric typewriter. All copy should be prepared to allow for a 15- or 20-percent reduction in size.

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TITLE OF MANUAL

MFR'S NUMBER

## PART I

## DESCRIPTION OF TURBINE AND GEAR

## GENERAL ARRANGEMENT

The design of the turbine and arrangement of the main parts are shown in the assembly drawing, Fig. 2. The turbine, as well as the gear and generator, is mounted on a rigid steel base as indicated in the outline, Fig. 1. The exhaust end of the turbine is carried from the base on

vertical supports which are rigid in a cross-axis direction but are flexible in an axial direction thereby allowing for axial expansion of the turbine casing under load conditions. The high-pressure end of the turbine is bolted rigidly to the gear casing.

## SECTION I

## DESCRIPTION OF TURBINE

The throttle valve is provided with both a hand-wheel for manual control and an emergency tripping device. The throttle valve will be tripped closed automatically by an emergency governor.

Fig. 2, is bolted to and caulked in the upper half of the high pressure head. The nozzle plate contains a series of reamed nozzles opening into ports on the high-pressure side.

## ROTOR AND BUCKETS

The turbine rotor (1), Fig. 2, consisting of shaft, bucket wheels, and coupling, is machined from a solid steel forging. The coupling flange of the rotor is tapped around its outer periphery for balancing plugs.

The throttle valve is provided with a handwheel for manual control and an emergency tripping device. The throttle valve will be tripped closed automatically by an emergency governor.

## Buckets

The buckets of all six wheels are made of corrosion-resisting steel. They are secured to the periphery of each wheel by dovetails. The spacing of the buckets around the wheels is determined by skirts at the dovetails. The skirts form a part of the buckets.

A shroud-band of corrosion-resisting steel extends completely around the outer circumference of the buckets on each wheel. This band closes over the tops of the buckets and, by projecting slightly on each side of the buckets, aids in preventing steam leakage over the tops of the wheels.

The low-pressure end of the rotor carries an emergency governor assembly. The housing of the assembly is machined to receive a ratchet wrench for turning the rotor by hand. A wrench for this purpose is furnished with the units.

## NOZZLE PLATE

The cast steel first-stage nozzle plate (3),

## NOZZLE DIAPHRAGMS

The nozzle diaphragms are made of steel corrosion-resisting steel nozzle partitions. The diagram five nozzle diaphragms are made of steel with welded corrosion-resisting steel nozzle partitions.

## Mounting

Because of the high steam temperature at the inlet end of the casing, the second-stage diaphragm is supported at the centerline to allow for radial expansion.

**SECOND STAGE DIAPHRAGM:** The lower half of the second stage diaphragm is further positioned by the centering dowel (7) in the bottom of the casing. Crush pins (4) around the periphery of the diaphragm assist in holding both halves securely in place.

**LOCATION OF DIAPHRAGMS:** The other four diaphragms, which are located in the exhaust casing are mounted as shown in Fig. 3b. The cast steel first-stage nozzle plate (3), Fig. 2 is bolted to and caulked in the upper half of the high pressure head.

The first stage is drained through a valve at the bottom of the casing.

## TURBINE CASING

The turbine casing consists of a steel high-pressure head (4), Fig. 2, and a steel exhaust casing.

Figure 7.

9999906 2107229 301

MFR'S NUMBER

TITLE OF MANUAL

PART 1DESCRIPTION OF TURBINE AND GEARGENERAL ARRANGEMENT

The design of the turbine and arrangement of the main parts are shown in the assembly drawing, Fig. 2. The turbine, as well as the gear and generator, is mounted on a rigid steel base as indicated in the outline, Fig. 1. The exhaust end of the turbine is carried from the base on vertical supports which are rigid in a cross-axis direction but are flexible in an axial direction thereby allowing for axial expansion of the turbine casing under load conditions. The high-pressure end of the turbine is bolted rigidly to the gear casing.

## SECTION 1

## DESCRIPTION OF TURBINE

The throttle valve is provided with both a handwheel for manual control and an emergency tripping device. The throttle valve will be tripped closed automatically by an emergency governor.

Rotor and Buckets

The turbine rotor (1), Fig. 2, consisting of a chined from a solid steel forging. The coupling outer periphery for balancing plugs.

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is tapped around its

The throttle valve is provided with a tripping device. The throttle governor.

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ELITE TYPE. REDUCED 15%

val for manual control and an emergency  
closed automatically by an emergency

Buckets

The buckets of all six wheels are made of corrosion-resisting steel. They are secured to the periphery of each wheel by dovetails. The spacing of the buckets around the wheels is determined by skirts at the dovetails. The skirts form a part of the buckets.

A shroud-band of corrosion-resisting steel extends completely around the outer circumference of the buckets on each wheel. This band closes over the tops of the buckets and, by projecting slightly on each side of the buckets, aids in preventing steam leakage over the tops of the wheels.

The low-pressure end of the rotor carries an emergency governor assembly. The housing of the assembly is machined to receive a ratchet wrench for turning the rotor by hand. A wrench for this purpose is furnished with the units.

Nozzle Plate

The cast steel first-stage nozzle plate (3), Fig. 2, is bolted to and caulked in the upper half of the high pressure head. The nozzle plate contains a series of reamed nozzles opening into ports on the high-pressure side.

Nozzle Diaphragms

The five nozzle diaphragms are made of steel with welded corrosion-resisting steel nozzle partitions. All of the diagrams five nozzle diaphragms are made of steel with welded corrosion-resisting steel nozzle partitions.

Mounting

Because of the high steam temperature at the inlet end of the casing, the second-stage diaphragm is supported at the centerline to allow for radial expansion.

Figure 8.

■ 9999906 2107230 023 ■

FIGURE 9 - WARNING

Voltages over 300 volts shall be measured as follows:

- (1) Deenergize the equipment. Ground terminals to be measured to discharge any capacitors connected to these terminals.  
(see Note F):
- (2) Connect meter to terminals to be measured using a range higher than the expected voltage.
- (3) WITHOUT TOUCHING METER OR TEST LEADS, energize the equipment and read the meter.
- (4) Deenergize the equipment. Ground the terminals connected to the meter before disconnecting meter.

## NOTES:

- (A) MAKE SURE YOU ARE NOT GROUNDED whenever you are adjusting equipment or using measuring equipment.
- (B) In general, USE ONE HAND ONLY when servicing live equipment.
- (C) If test meter must be held or adjusted while voltage is applied, GROUND the case of the meter before starting measurement and DO NOT touch the live equipment or personnel working on live equipment while you are holding the meter. Some moving vane type meters should not be grounded. These should not be held during measurements.
- (D) DO NOT FORGET that high voltages MAY BE PRESENT across terminals that are normally low voltage, due to equipment breakdown. Be careful even when measuring low voltages.
- (E) DO NOT use test equipment known to be in poor condition.
- (F) High voltage high capacity capacitors should be discharged with a grounding stick with approximately 10 ohms in series with the grounded line. Where neither terminal of a capacitor is grounded. Short capacitor is grounded, short capacitor terminals to each other.



# **Exhibit R**

Raytheon  
 Santa Barbara  
 Library C.1  
 MIL-M-15071C(SHIPS)  
 10 SEPTEMBER 1957  
 SUPERSEDING  
 MIL-T-15071B(SHIPS)  
 16 AUGUST 1954

**MILITARY SPECIFICATION**  
**MANUAL, TECHNICAL, FOR MECHANICAL**  
**AND ELECTRICAL EQUIPMENT (LESS ELECTRONICS)**

**1. SCOPE.**

**1.1 Scope.** — This specification covers the minimum requirements for preparing and revising technical manuals for electrical and mechanical equipment(s). The requirements for electronic equipment are covered in Specification MIL-M-16616. In addition, it covers the requirements for approval procedures; production and reproduction; quality and distribution; and packing and packaging.

**1.2 Classification.** — Technical manuals shall be of the following types as specified (see 6.1):

**Type I** — Type I manuals are required for experimental equipment procured to determine either military suitability or the ability of a manufacturer to meet military specifications. (See 3.1 and 3.2)

**Type II** — Type II manuals are required where the equipment to be described has no direct commercial counterpart or which is sufficiently complex that more extensive information is necessary. (See 3.1 and 3.3)

**Type III** — Type III manuals are required where the equipment to be described is an adaptation or variation of conventional commercial equipment, where, with certain modifications and additional data, the type of instruction matter normally furnished will serve the purpose. (See 3.1 and 3.4)

**Type IV** — Type IV manuals are standard commercial manufacturers' instructions on relatively simple equipment which will be adequate subject to minor modifications. (See 3.1 and 3.5)

**2. APPLICABLE DOCUMENTS**

**2.1** The following specifications, standards, drawings and publications, of the issue in effect on date of invitation for bids form a part of this specification:

**SPECIFICATIONS**

**FEDERAL**

LLL-B-631-Boxes; Fiber Corrugated (for Domestic Shipment).  
 LLL-B-636-Boxes; Fiber Solid, (for Domestic Shipment).  
 PPP-B-585-Boxes; Wood, Wirebound.  
 PPP-B-591-Boxes; Fiberboard, Wood-Cleated.  
 PPP-B-601-Boxes; Wood, Cleated-Plywood.  
 PPP-B-621-Boxes; Wood, Nailed and Lock-Corner.

**MILITARY**

JAN-P-108-Packaging and Packing for Overseas, Shipment Boxes, Fiberboard (V-Board and W-Board), Exterior and Interior.  
 MIL-P-116-Preservation, Methods of  
 MIL-B-10377-Boxes; Wood-Cleated, Veneer, Paper Overlaid.  
 MIL-L-10547-Liners, Case, Waterproof.

**MIL-M-15071C (SHIPS)****NAVY DEPARTMENT**

General Specifications for Inspection of Material.

**STANDARDS****MILITARY**

MIL-STD-218-2 Technical Manuals Part 2 – Production or Procurement of Artwork for Technical Manuals.

MIL-STD-218-3 Technical Manuals Part 3 – Preparation of Manuscript (Final, Typed) for Technical Manuals.

MIL-STD-12 Abbreviations for use on Drawings.

MIL-STD-15 Electrical and Electronic Symbols.

MIL-STD-16 Electrical and Electronic Reference Designations.

MIL-STD-17 Mechanical Symbols.

MIL-STD-103 Abbreviations (for Electrical and Electronic Use).

MIL-STD-129 Marking for Shipment and Storage.

**DRAWINGS****BUREAU OF SHIPS**

S0103-73729 – Standard Drawing Format for Production Drawings Prepared by Contractor or Manufacturer for approval by Government Agencies.

**PUBLICATIONS****DEPARTMENT OF DEFENSE**

DD441 (Attachment) – Industrial Security Manual for Safeguarding Classified Information.

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

**2.2 Other publications.** – The following document forms a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

**CONSOLIDATED CLASSIFICATION COMMITTEE**

Consolidated Freight Classification Rules.

(Application for copies should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago 6, Ill.)

**3. REQUIREMENTS.****3.1 General requirements.**

**3.1.1 Material.** – The minimum material requirements shall be as specified hereinafter. A good grade of printing and materials shall be used when not definitely specified.

**3.1.2 Identification.** – Technical manuals shall be identified by a Navy identification number of the form "NAVSHIPS 300-0000" (see figures 1 and 2). Numbers will be assigned only by the Bureau of Ships upon receipt of a preliminary copy of the manual. In urgent cases, a letter request, containing complete descriptive data of the equipment, will be honored for the purpose of assigning a NAVSHIPS number (see 3.1.8.1). This number shall be imprinted on the upper left hand corner of the cover, and printed on the upper right hand corner of the title page of all final copies of the manuals prior to distribution (see figures 1 and 2).

MIL-M-15071C(SHIPS)

**3.1.3 Copyright.** — Technical manuals shall not be copyrighted. The bureau or agency concerned reserves the right to reproduce or have reproduced in part or in entirety all manuals procured under this specification.

**3.1.4 Security classification.** — The security classification of the manuals shall be as designated by the bureau or agency concerned. If classified, the security requirements of the Industrial Security Manual for Safeguarding Classified Information DD441 (Attachment) shall be followed. For classified manuals all pages shall bear appropriate security classification located as shown on figures 1 through 13. The word "UNCLASSIFIED" shall appear on each page of unclassified sections of classified manuals. Revisions (see 3.1.6) shall be classified as required by their subject matter. Revised pages (see 3.1.6.2) shall have the same classification as the original pages, unless otherwise specified by the bureau or agency concerned. Information with a security classification higher than that established in table I for a section that is considered essential shall be brought to the attention of the bureau or agency concerned. A volume shall be classified the same as the highest classification within the volume. The sections of the manual shall be classified as shown in table I, unless the bureau or agency concerned approves content with a higher classification.

TABLE I

SECTION	Equipment classification		
	UNCLASSIFIED	CONFIDENTIAL <sup>1</sup>	SECRET
1. General Information	UNCLASSIFIED	CONFIDENTIAL <sup>1</sup>	SECRET
2. Principles of Operations	UNCLASSIFIED	CONFIDENTIAL <sup>1</sup>	SECRET
3. Operating Instructions	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
4. Installation	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
5. Maintenance	UNCLASSIFIED	CONFIDENTIAL <sup>1</sup>	SECRET
6. Parts list	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
7. Drawings	UNCLASSIFIED	CONFIDENTIAL <sup>1</sup>	SECRET

<sup>1</sup>Substitute - "Confidential - Modified handling authorized" - for equipments so classified.

In addition to being marked with the appropriate security classification each classified manual shall bear the following notation printed on the title page (as shown on figure 2):

"WARNING: This material contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law."

**3.1.5 Additional manuals.** — There shall be printed upon the title page of all final manuals the notice as shown on figure 2 advising where additional copies of the manual may be obtained.

**3.1.6 Revision to incorporate changes.** — New, revised, or supplementary pages shall be furnished until the guarantee period of the equipment expires.

**3.1.6.1 New pages.** — When it is found necessary to include new information to augment the content of the original manual, new pages shall be issued. These pages shall be identified with the following legend placed in the bottom outside corner adjacent to the page number but toward the binding edge of each page. Include on the first line, the word "New" followed by the NAVSHIPS identification number, and on the second line, the month and year of issue. New pages shall bear the same number as the page they follow and shall be further annotated using the decimal system; for example, original page 1-1-14, new pages 1-1-14.1 and 1-1-14.2 (see 3.3.2.5 for numbering). A reproduction copy of each new page shall be provided.

**MIL-M-15071C(SHIPS)**

**3.1.6.2 Revised pages.** – If it is determined that information originally furnished in manuals must be changed for clarification, correction or because every equipment covered by the manual has been uniformly modified, revised pages shall be issued. These pages shall be identified with the following legend placed in the bottom outside corner adjacent to the page number but toward the binding edge of each page. Include on the first line, the word "Revised" followed by the NAVSHIPS identification number, and on the second line the month and year of issue. Revised pages shall bear the same number as the page they replace and if the revised information should require the use of additional pages they shall be annotated using the decimal system (see 3.3.2.5 for numbering.) A reproduction copy of each revised page shall be provided.

**3.1.6.3 Supplementary pages.** – In instances where modifications are made only to a portion of the total number of equipments covered by the manual, resulting in the need for alternate instructions to cover those items modified, this information shall be issued in the form of supplementary pages. These pages shall be identified with the following legend placed in the bottom outside corner adjacent to the page number but toward the binding edge of each page. Include, on the first line, the word "Supplementary" followed by the NAVSHIPS identification number, on succeeding lines the hull numbers of the specific ships to which the page applies and on the last line, the month and the year of issue. Supplementary pages shall bear the same number as the manual page they follow and shall be further annotated using the decimal systems; for example, original page 1-1-14, supplementary pages 1-1-14.1 and 1-1-14.2. (See 3.3.2.5 for numbering.) A reproduction copy of each supplementary page shall be provided.

**3.1.7 Time of delivery.** – Every effort shall be made to submit the preliminary manual in ample time to permit approval and final printing prior to the delivery date of the equipment (see 3.1.8.1). Two copies of each final manual shall be delivered with the first unit and each succeeding unit of equipment shipped (see 3.6). If final manuals are not available at the time of delivery of equipment, two copies of an adequate preliminary manual packed with each unit of equipment shall be furnished. In all instances where preliminary manuals are furnished in lieu of final manuals they shall be replaced with final manuals within 60 days (see 3.1.8.2.4).

**3.1.8 Preliminary manuals. –**

**3.1.8.1 Method of approval.** – Prior to printing final manuals, the manufacturer shall prepare and submit, as indicated herein, a preliminary manual, in duplicate, for approval and assignment of a NAVSHIPS number (see 3.1.2). NAVSHIPS numbers will be assigned only by the Bureau of Ships. At the time of submission of preliminary manuals, the manufacturer shall submit a letter of transmittal forwarding the preliminary manual which shall state the expected delivery date of final manuals and the quantity of manuals being furnished for stock in accordance with 3.6. The preliminary manuals shall be forwarded by the contractor to one of the following activities, as appropriate:

(a) *Manuals procured by the Bureau of Ships* - Contractor shall forward preliminary copies via the cognizant Government inspector to the Bureau of Ships for approval and assignment of a NAVSHIPS number.

(b) *Manuals procured by Naval activities other than the Bureau of Ships* – Contractor shall forward preliminary copies to the Naval activity for their approval and transmittal to the Bureau of Ships for assignment of a NAVSHIPS number.

(c) *Manuals procured for the Navy by a commercial activity (such as a shipbuilder at a private yard) or other Government agency* – Contractor shall forward preliminary manuals to the cognizant Naval supervising activity or other Government agency, as appropriate, for their approval and transmittal to the Bureau of Ships for assignment of a NAVSHIPS number.

**3.1.8.2 Contents. –**

**3.1.8.2.1 Approval and procurement record page.** – In each preliminary manual exactly identical to one previously procured and assigned a NAVSHIPS number an approval and procurement record page (see figure 3a) shall be provided and inserted immediately following the title page. In each preliminary manual not exactly identical to one previously procured and assigned a NAVSHIPS number, an approval and procurement record page (see figure 3b) shall be provided and inserted immediately following the title page.

**3.1.8.2.2 Text.** – Preliminary manuals shall consist of a complete text of the instructions required for the type of manual to be furnished.

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**3.1.8.2.3 Figures.** — Preliminary manuals shall contain a list of all figures (photographs, exploded views, and drawings) and shall include sample art work (all exploded views and sketches) which will appear in the final manual. If the final manual is to include test data, or a table of weights, for example, and if any of the items are not available when the preliminary manual is issued, then a foreword shall state which items have been omitted.

**3.1.8.2.4 Manual identification.** — In all instances where preliminary manuals are furnished in lieu of final manuals, the NAVSHIPS identification number preceded by the word "PRELIMINARY" shall be stamped or hand printed on the covers of all copies of the preliminary manuals prior to distribution (see 3.1.2). This number shall be imprinted on the upper left hand corner of the cover, and printed on the upper right hand corner of the title page.

**3.1.8.2.5 Covers.** — Covers for preliminary manuals shall be at least 20 by 26-65/500 - basis gray antique finish cover stock or similar material, bellows fold, with the title and other pertinent information on the cover. This information shall be identical with that which will appear on the final manual. (See figure 1).

**3.1.8.2.6 Printing.** — The text of preliminary manuals may be printed by any quick, economical method, such as multigraph, mimeograph or similar method.

**3.2 Type I manuals.** — The preparation and contents of the type I manuals shall be as specified in the individual contract or order.

**3.3 Type II manuals.** —

**3.3.1 Contents.** — Type II manuals shall contain the following information as applicable presented in the order listed (see figures 1 to 13 inclusive).

- Front matter.
- Section 1 - General information.
- Section 2 - Principles of operations.
- Section 3 - Operating instructions.
- Section 4 - Installation.
- Section 5 - Maintenance.
- Section 6 - Parts list.
- Section 7 - Drawings.
- Memorandum.

**Note.** — When a manual covers an equipment composed of several distinct units (for example, a generating set consisting of a diesel engine, a generator, a voltage regulator, and a controller), it may be necessary to arrange the manual in major divisions, each covering one unit. If so, the major divisions may be arranged by subdivisions, each corresponding to the requirements listed herein. The order listed herein may be altered with the approval of the Bureau or agency concerned.

**3.3.1.1 Front matter.** — The front matter for type II manuals shall consist of the following:

- (a) Cover.
- (b) Title page.
- (c) Approval and procurement record page.
- (d) List of effective pages.
- (e) Correction page.
- (f) Table of contents.
- (g) List of figures.
- (h) List of tables.

**3.3.1.1.1** The list of effective pages shall be required in classified manuals only, and in multiple volume manuals shall be a separate page for the contents of each volume.

**3.3.1.1.2** The title page, table of contents, list of figures and list of tables shall be a separate page for the contents of each volume.



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**3.3.1.1.3 Approval and procurement record page.** — In all final copies of the manual, the manufacturer shall include an approval and procurement record page inserted immediately following the title page. Figures 3a or 3b gives the format that shall be followed in its preparation.

**3.3.1.1.4 List of effective pages.** — A list of effective pages (see figure 4) shall be prepared for all final manuals classified for security purposes (see 3.1.4) and copies thereof. For multiple volume manuals there shall be prepared a separate list for the contents of each volume.

**3.3.1.1.5 Correction page.** — A correction page (see figure 5) shall be furnished for all final manuals and copies thereof for the purpose of making revisions in accordance with 3.1.6. For multiple volume manuals there shall be prepared a separate correction page for each volume.

**3.3.1.1.6 Table of contents.** — The table of contents (see figure 6) shall list all primary divisions and secondary subdivisions such as chapters, sections, and main paragraphs, with their corresponding paragraph numbers and page numbers. Where sub-manufacturers are furnishing associated equipment it shall be the responsibility of the prime contractor to integrate and reflect the information provided by the sub-manufacturers within the table of contents.

**3.3.1.1.7 List of figures and drawings.** — A list of figures (see figure 7) which have been assigned figure numbers shall be prepared. The list shall be arranged in numerical sequence by figure number and shall give the figure title (see 3.3.3.8) and page number.

**3.3.1.1.8 List of tables.** — The list of tables (see figure 8) shall follow the list of figures and drawings. It shall include all tables assigned numbers and shall be arranged in numerical sequence by table number.

**3.3.1.2 Section 1 — General information.** — This section shall include general data, an introduction, and a detailed description.

**3.3.1.2.1 General data.** — This portion of the manual shall contain the following data:

(a) Component list and performance design characteristics: The name of each component and the respective manufacturer's name with its complete rated performance characteristics for continuous or intermittent operation and, where applicable, maximum permissible overload characteristics and their duration. In addition, a description of the item shall be included to distinguish it from other items of the same general category. For instance, a motor shall be distinguished as to the specific type of motor for example, as a.c., synchronous, totally enclosed, etc.

(b) Navy type designation.

(c) Principal overall dimensions.

(d) Weights (with or without packing).

(e) Allowable clearances, temperatures, pressures, pressure and blow range settings or tolerances shall be shown in tabular form.

**3.3.1.2.2 Introduction.** — This division shall include a general description of the equipment; explain briefly what it is, where it is used, what it will do, and the general overall and interrelated operation of the various units. All information of a general character applicable to the complete equipment shall also be given. Where the text contains technical terms, terms not commonly used, or symbols, definitions shall be included.

**3.3.1.2.3 Detailed description.** — This division shall contain a complete detailed description of units and assemblies which comprise the complete equipment; for example, ship service turbogenerator, the turbine, reduction gear, generator and exciter.

**3.3.1.2.4 Section 2 — Principles of operation.** — This division shall contain a brief resume of the principles of operation. Figures, sketches, performance curves, and schematic wiring diagrams shall be included to convey an understanding of the function and operation of the equipment (see 3.3.1.2.9).

**3.3.1.2.5 Section 3 — Operating instructions.** — Information shall include routine and emergency procedures, and safety precautions; maximum and minimum loads; normal temperature or pressure limits or both; trans-

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for from manual to automatic operation (or the reverse), to be observed in the starting, operating, stopping, and shutting down of the equipment. In addition, action(s) shall be described which should be taken in the event of power failure; control air failure; generating tube failure; lube-oil failure; steering gear failure; partial failure of equipment; and similar conditions. Action(s) described in the event of partial failure shall include, where practicable, those procedures necessary to provide continued service of the equipment until an opportune time is available to repair the equipment. Where operating procedures are to be performed in specific sequence, step-by-step procedures shall be given. Operations shall be numbered in the order in which they are performed. Operating data which is frequently referred to in operating the equipment shall be included. Tables and charts shall be used for the presentation of these instructions where varying operating conditions are encountered.

**3.3.1.2.6 Section 4 - Installation.** - This division shall contain methods of installation, including packing or unpacking, handling, preparation of foundation, alignment, precautions, mounting instructions, bolting diagrams, recommendations regarding shielding, safety guards, grounding or bonding.

**3.3.1.2.7 Section 5 - Maintenance.** -

**3.3.1.2.7.1 Preventive maintenance.** - This division shall cover all maintenance procedures, inspection, tests, test data, and adjustments which should be performed periodically and regularly for the purpose of preventing failure or impairment of the equipment. Routine maintenance check charts or instructions or both shall be provided. They shall include, but shall not necessarily be limited to the following:

- (a) A tabulation of periodic, routine, mechanical, and electrical tests and checks which should be accomplished regularly to insure continuity of service at optimum performance.
- (b) Tables or charts or both to indicate what is to be done, when it is to be done, and how to do it.
- (c) Utilization of the test facilities which may be incorporated in the various components.
- (d) Instructions for the care, inspection, and cleaning of all pertinent parts.
- (e) Instructions stressing the importance of properly maintaining any safety devices or interlocks provided to prevent damage to equipment or injury to personnel.
- (f) Instructions on lubrication shall be provided as applicable, preferably in chart form. They shall include information regarding lubrication recommended by the manufacturer, the type of lubricant to be used, together with specific time periods. Lubricants shall be described by Military specification numbers where applicable and by commercial designations.

**3.3.1.2.7.2 Corrective maintenance.** - This division shall cover all information necessary to permit a technician to locate trouble, and to make repairs, adjustments and conduct tests of each component, assembly or sub-assembly of the equipment upon initial installation or under other conditions such as after major overhaul where complete readjustment may be required. Included in this division shall be the following:

- (a) Trouble shooting guides for the localization of faults giving possible sources of trouble, the symptoms, probable cause, and instructions for remedying the faults.
- (b) Complete instructions on signal tracing for electric circuits, use of test instruments and other common servicing techniques.
- (c) Ample figures, photographs, exploded views giving details of mechanical assemblies, and simplified schematic diagrams of electrical, mechanical, hydraulic and pneumatic circuits. Figures contained in other divisions may be used and referred to under this division without duplicating them.

**3.3.1.2.8 Section 6 - Parts list.** - This section shall contain identification data covering all repair parts to facilitate ready identification of parts for replacement and ordering purposes. Do not list standard hardware, structural parts, indicating instrument parts or other parts which have no maintenance significance.

**3.3.1.2.8.1 Contents.** - The parts list shall contain the following subdivisions:

- (a) Introduction.
- (b) Parts tabulation.
- (c) Special tools.

**3.3.1.2.8.1.1 Introduction.** - This division shall contain sufficient instructions to explain the following:

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- (a) Any symbols used for the parts tabulation.
- (b) All cross index systems employed.
- (c) Titles or other markings intended to segregate different models.
- (d) Other information as may be required to facilitate rapid and accurate use of the parts list.

**3.3.1.2.8.1.2 Parts tabulation.** – The parts tabulation shall contain information specified in 3.3.1.2.8.1.2.1 and 3.3.1.2.8.1.2.2 presented in an intelligible sequence. An intelligible sequence may be obtained by listing parts by spatial or functional groups.

**3.3.1.2.8.1.2.1 Tabulation for mechanical parts.** – Tabulation for mechanical parts shall contain the following:

- (a) – Figure number. This shall denote the figure number wherein the part has been shown.
- (b) – Index number. This number shall denote main assembly, sub-assembly or part identified which is utilized on the reduced size drawing(s) or other figure(s) included in the manual.
- (c) – Nomenclature for part using actual manufacturer's name.
- (d) – Number required.
- (e) – Contractor's service part number.
- (f) – Actual manufacturer's service part number.

**3.3.1.2.8.1.2.2 Tabulation for electrical parts.** – Tabulation for electrical parts shall contain the following:

- (a) – Figure number. This shall denote the figure number wherein the part has been shown.
- (b) – Index number or reference designation (see 3.3.1.2.9.3). This number shall denote main assembly, sub-assembly or part identified which is utilized on the reduced size drawing(s) or other figure(s) included in the manual.
- (c) – Nomenclature for part using actual manufacturer's name.
- (d) – Number required.
- (e) – Contractor's service part number.
- (f) – Actual manufacturer's service part number.
- (g) – In addition to the requirements of (a) through (f) a separate functional listing by part name shall be stated alongside each part giving the use, purpose, or the function of the part in the assembly.

**3.3.1.2.8.1.3 Special tools.** – A separate list shall immediately follow the parts tabulation under the heading "Special Tools" which are supplied with the equipment; that is, tools that are peculiar to the equipment showing the quantity, unit of issue (each, pair, set), description, and manufacturer's identification number.

**3.3.1.2.9 Section 7 – Drawings.** – This division shall contain reproductions of drawings, additional block diagrams, schematic drawings, and exploded views of explanatory drawings, as necessary to supplement the descriptive matter contained in the text. Diagrams of switches and relays used in the system showing the terminal numbering shall be inserted as additional drawings. The standard color codes for resistors and capacitors shall be stated, where applicable. A sufficient number of reduced size drawings which are prepared in accordance with the standard drawing format shown on Drawing S0103-73729 (see figure 13) shall be included to aid in the identifications of the parts in the "Parts List" (see 3.3.1.2.8). Other figures shall be included to supplement or extend the information contained in the reduced size drawings prepared in accordance with the standard drawing format shown on Drawing S0103-73729 as required for further identification of parts and explanation of the descriptive information contained in the text.

**3.3.1.2.9.1 Symbols.** – Symbols shall be used as necessary. Symbols utilized for the preparation of block diagrams, schematic diagrams, or other explanatory drawings which are not prepared in accordance with Drawing S0103-73729, shall be those contained in the applicable Military Standard as follows:

- (a) Symbols for electrical equipment shall be in accordance with Standard MIL-STD-15.
- (b) Mechanical symbols shall be in accordance with Standard MIL-STD-17.

**3.3.1.2.9.2 Abbreviations.** — Abbreviations shall be used on drawings only when their meaning is unquestionably clear. Abbreviations when utilized on drawings which are not prepared in accordance with Drawing S0103-73729 shall be in accordance with Standards MIL-STD-12 and MIL-STD-103.

**3.3.1.2.9.3 Reference designations.** — For use on diagrams of electrical circuits which are not prepared in accordance with Drawing S0103-73729 the applicable reference designations contained in Standard MIL-STD-16 shall be utilized. These designations shall be utilized for the purpose of correlating graphical symbols shown thereon with the "Parts List" (see 3.3.1.2.8.1.2.2) and descriptions of, and instructions concerning the circuits. A reference designation *is not* an abbreviation for the name of the part.

**3.3.1.2.10 Memorandum pages.** — Three blank sheets (six pages) shall be inserted at the end of the manual for memorandum purposes. Each page shall be marked "Memorandum" at the top center.

### **3.3.2 Format. —**

**3.3.2.1 Volumes.** — Should the summation of information submitted result in an unreasonably bulky manual, the information shall be divided into two or more volumes. The cover of each manual (volume) shall be printed in accordance with figure 1 with the addition of the following as to the respective volume number and the number of volumes comprising the total information furnished; for example, VOLUME I of III; VOLUME II of III; VOLUME III of III. Each volume will be identified by the same NAVSHIPS number (see 3.1.2).

**3.3.2.2 Divisions (chapters or sections).** — Divisions of manuals shall be by chapters or sections, numbered or lettered consecutively (see 3.3.2.5). In general, chapters shall be the main divisions of larger manuals and sections should be the main divisions of smaller manuals. Chapters in larger manuals may be further divided into sections.

**3.3.2.3 Page identification.** — At the top of each page the following shall appear (see figures 9 and 10):

- (a) Each left hand page -
  - (1) Briefed title of the manual flush with the outside margin.
  - (2) Paragraph number flush with the inside margin.
- (b) Each right hand page -
  - (1) Division, chapter or section number and title flush with the outside margin.
  - (2) Paragraph number flush with the inside margin.

**3.3.2.4 Paragraphs.** — Paragraphs shall not be titled or numbered more extensively than is necessary to facilitate reference. Individual paragraph numbering may be omitted, provided the text is so prepared that reference to each paragraph by number is unnecessary. Main paragraphs shall be numbered consecutively within each division, chapter, or section, using Arabic numerals separated by a dash. The number following the dash will indicate the number of the paragraph within the section; for example, "2-17" is the 17th paragraph of section 2. Similarly for manuals subdivided by chapter and section both the chapter and section number shall precede the paragraph number; for example, "2-4-10" is the 10th paragraph of section 4 contained in chapter 2. The main paragraph numbers and title shall stand alone on one line (see figures 9 and 10). It is suggested that individual steps of a step-by-step procedure be identified by step number rather than by paragraph number; for example, Step 1, Step 2, etc.

**3.3.2.5 Numbering.** — Front matter pages shall be numbered in lower case Roman numerals. The cover, title page, and approval and procurement record page shall not be numbered. Pages of the manual(s) shall be numbered consecutively within each division, chapter (or section). Arabic numerals shall be used for numbering for all pages other than the front matter. All odd numbered pages shall appear as right hand pages. Pages, tables, and figures shall be numbered consecutively within each chapter (or section) but each starting with the number "ONE". The page, table, and figure number shall be preceded by the chapter (or section) number. For example, page 3 in section 4 shall be numbered page 4-3; table 5 in section 2 shall be numbered table 2-5; figure 2 in section 1 shall be numbered figure 1-2. Where manuals are divided by chapter and section the chapter and section number both shall precede the pages, table, and figure number. Page numbers shall be placed at the lower outer corner of the page.

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3.3.2.5.1 Fold over pages shall be right hand pages printed on one side only and when they are used they shall be assigned two page numbers. The page numbers shall appear on the face of the sheet at the lower righthand corner (see figure 13). Fold over pages shall be arranged so that page numbers and figure numbers are visible without unfolding. Fold over arrangements shall be as shown on figure 13.

3.3.2.6 **Layout treatment.** — The layout of the manuals shall be such as to conserve space without detracting from the utility or clarity of the material presented. Blank pages and spaces shall be avoided wherever possible with the exception specified in 3.3.1.2.10 and in 3.3.2.6.1. Normally, textual material shall be printed on both sides of the sheet. Figures serving no instructional function or to which no reference is made in the text shall not be used. Partial page figures within the text are highly desirable although several small figures may be grouped to form a single page layout. Whenever possible, figures within the text shall be located so that reference can be made from applicable text without turning a page. Whenever it is necessary to include fold over pages they shall be inserted at the end of the applicable division, chapter or section.

3.3.2.6.1 All drawings which are inserted as fold over pages shall be provided with a blank apron page at the left hand edge of the fold over page (see figure 13). This will permit the printed portion in its entirety to be visible while the text is being studied.

**3.3.3 Text. —**

3.3.3.1 **Wording.** — The text shall be factual, specific, concise, and clearly worded so as to be readily understandable to relatively inexperienced personnel involved in the operation and maintenance of the equipment, yet provide technicians with sufficient information to install, operate, service, and maintain the equipment at peak performance. Technical phraseology requiring a specialized knowledge shall be avoided except where no other wording will convey the intended meaning, in which case the technical term shall be defined.

3.3.3.2 **Emphasis.** — When necessary, emphatics such as “NOTE”, “CAUTION”, and “WARNING” shall be used as adjuncts to the text. These, however, shall be used as sparingly as is consistent with the real need. The appropriate adjunct to the text shall be selected in accordance with the following definition:

- (a) “NOTE” — An operating procedure, condition, etc., which it is essential to highlight.
- (b) “CAUTION” — Operating procedures, practices, etc., when if not strictly observed, will result in damage or destruction of equipment.
- (c) “WARNING” — Operating procedures, practices, etc., which will result in personal injury or loss of life if not correctly followed.

3.3.3.3 **Grammatical person and mode.** — The second person imperative shall be used for operational procedures; for example: “Disengage jacking gear from main engine reduction gears”. The third person indicative shall be used for description and discussion; for example: “The jacking gear rotates the main shaft and main engine by engagement of the main reduction gears”.

3.3.3.4 **Nomenclature consistency.** — Nomenclature used shall be consistent throughout the manual. For example, a part once identified as a “cover” shall not be referred to elsewhere as a “plate”. That portion of the nomenclature that is used shall agree with the parts list nomenclature.

3.3.3.5 **Tables and charts.** — The use of tables and charts is desirable. Tables and charts shall be as simple as possible with sufficient explanation to make them easily used and understood. When material is presented in tabular form for ready reference purposes, as when listing weights, measures, condensed trouble shooting information, etc., the tabulation shall be numbered by table (or chart) number and chapter (or section) number. Thus, table 3 in chapter 4 shall be numbered table 4-3.

3.3.3.6 **Measures.** — The system of standard U. S. customary units of weights and measures shall be used. As a general rule all references to liquid capacities shall be given in U. S. standard units of liquid measure. When scientific or medical equipment is of a type which makes references to metric weights and measures customary, such references may be used.

3.3.3.6.1 **Temperature references.** — Temperature readings shall be given in degrees Fahrenheit or degrees Centigrade (Celsius), whichever is standard in U. S. industry. (In general, Fahrenheit is used with mechani-



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cal equipment and Centigrade (Celsius) is used with electric equipment.) Also, one may follow the other in parentheses, for example: 194°F (90°C) or 90°C (194°F).

**3.3.3.7 Figures** – A view of each assembly, sub-assembly and the component parts thereof shall be shown as necessary to supplement the text and aid in the identification of parts. Identification of illustrated parts with the listed parts shall be facilitated by the use of key numbers (or more commonly known as piece numbers or index numbers) and arrows which will identify assemblies, sub-assemblies and component parts thereof. Figures of the exploded type may be used. When the use of exploded views is not practical, simple cross sectional views may be used. It is preferable when cross sectional views are used that they be approved drawings or excerpts from approved drawings. In the event no applicable drawing is available, cross sectional views from manufacturer's drawings may be used. Reduced figures for reproduction from validated master figures do not require revalidation.

**3.3.3.8 Figure titles.** – Figure titles shall indicate clearly in a brief descriptive phase what is portrayed, by giving the function or process illustrated, the nomenclature of the equipment shown, or other pertinent and quickly understood identification.

Examples:

- (a) Wing hydraulic system.
- (b) Model D-3-401 wheel assembly.
- (c) Measuring o.d. of clutch cone.
- (d) Removing rotor and plate with fixture.

**3.3.3.9 Indexing and referencing of figures. –**

**3.3.3.9.1** Significant features or components of figures shall be identified by brief applicable nomenclature with arrows. Index numbers may be used on figures with explanatory legend on the sketch or photo when an extremely large amount of nomenclature is required.

**3.3.3.9.2** In order to assure a clear definition of lines where they pass through light and dark areas, arrows (leaders) shall be drawn in black with one edge outlined in white. The arrow head, however, shall be completely outlined in white. The thickness of arrows shall be uniform and no greater than necessary to indicate clearly the desired details.

**3.3.3.9.3** Index references and letterings (nomenclature) shall be planned to reproduce uniformly a size not less than 10 point type.

**3.3.3.10 Deleted figures.** – When a change requires deletion of a figure without substitution of another, the following sentence shall be inserted "Figure \_\_\_\_\_ deleted" in or near the place of deletion.

**3.3.3.11 Multiple reference.** – Where references are made in a paragraph to several items in the same figure, as in instructions detailing maintenance procedures, the figure number need be given only once at the beginning of the references (usually the beginning of the paragraph) with index numbers (or reference designation) of the items placed in parentheses in the body of the text where pertinent. Care shall be taken that such references are entirely clear. An example is the following portion of a paragraph:

"10. DISASSEMBLY OF AIR VALVE (see figure 1-5)  
a. Unscrew safety disc retainer (2) from valve body (1) and remove safety disc (3) and safety disc washer (4)."

**3.3.3.12 References to figures.** – Where reference is made to figures, the reference shall be to the figure number and the chapter (or section) number. The page number shall not be used. Where reference is made to items shown on figures by index numbers, figure number and index number shall be indicated as follows: "Remove nut (7) and drive out bolt (8) (see figure 1-5)."

**3.3.3.13 Specification and standard references.** – When Government specification or standard numbers are referred to, only the basic numbers shall be mentioned, omitting the revision letter suffix unless it is es-





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sential to mention a particular issue of a specification or standard. References to specifications and standards shall be made as follows: "Federal Specification P-S-661", "Military Specification MIL-C-5020", "Military Standard MIL-STD-105", etc. All materials, required for maintenance referred to in the manual, such as lubricants, solvents, additives, scaling materials, abrasives, etc., shall be described by Military Specification numbers where applicable. Commercial designations may be used when there is no applicable Government specification.

**3.3.3.14 Numbers.** — Numbers used at the beginning of a sentence shall be spelled out and followed by the numeral in parentheses.

**3.3.4 Production and reproduction requirements for type II manuals. —**

**3.3.4.1 Graphics.** — The quality of art work for type II manuals (such as photographs, renderings, line drawings and diagrams) shall conform to the quality requirements of Standard MIL-STD-218-2.

**3.3.4.1.1 Photographs.** — Photographic figures shall be prepared with equipment capable of reproducing all details and shall show clearly the subject matter. Photographs shall be uniformly retouched as necessary to define shapes, accentuate details, and establish correct tone value of sufficient contrast for photolithographic reproduction.

**3.3.4.1.2 Exploded views.** — Exploded views may be used for representation of parts of machinery or equipment to show proportionate size, proper relation to other parts, and assembly or disassembly sequence. It is preferable that all parts be exploded in isometric projection of their line of assembly axis (see figure 12).

**3.3.4.2 Color.** — Color shall be used functionally where it is absolutely necessary to show electrical or mechanical circuits, the flow of materials, schematic diagrams or operational diagrams. Cross hatching or similar methods of media shall be employed in lieu of color wherever possible. Color selection shall be based on the primary colors, which may be used in flat combination or screened for texts. A legend on the artwork shall explain the significance of each color used. In no case shall color be used for background or other decorative purpose.

**3.3.4.3 Printing.** — Printing shall be done by either photo-offset, or letterpress method, and shall be of equal quality to first-class commercial work. Reproduction copy may be type-set, varityped, or typewritten with a standard typewriter. In general, type-set copy is preferred with varityped or typewritten copy as second choice. Final typed manuscript shall conform to the requirements of Standard MIL-STD-218-3. The style of composition to be used, however, shall be governed by the quantity of manuals to be produced, the relative costs of the several methods and the availability of material prepared for earlier manuals. The contractor shall specify the method of composition to be used when manuscripts or sample copies are submitted for approval. The bureau or agency concerned may request data from the contractor to substantiate the method of composition chosen if deemed necessary.

**3.3.4.3.1 Arrangement.** — The text may be arranged in the form of either two vertical columns or a single wide column. The two column arrangement shown on figure 10 is preferred; the single column arrangement is shown on figure 9. Right hand margins shall not necessarily have lines flush at the right, but care shall be taken to prepare a generally uniform margin. Final trim size shall be 8-3/8 by 10-7/8 inches. Text shall be printed on both sides except as otherwise specified herein for fold over pages.

**3.3.4.4 Paper.** — The paper for the photo-offset reproduction shall be preferably 25 by 38-50/500 basic offset; for letterpress 25 by 38-70/500 basic dull coated book paper.

**3.3.4.5 Covers.** — Covers for manuals less than 1/2 inch thick (less cover) shall be of the bellows fold type and of a black fabrikoid material, weight 6-1/2 to 7-1/2 ounces per square yard (finished cloth). Covers for manuals over 1/2 inch thick shall be made of semiflexible board covered with black fabrikoid material, weight 6-1/2 to 7-1/2 ounces per square yard. The information shown on figure 1 shall be imprinted in gold, silver, or aluminum color on the cover. Backbones of manuals over 1/2 inch thickness shall be imprinted with the NAVSHIPS number (Navy identification number) and title in brief. Covers shall overlap the top, bottom, and outside edge of the manual by 3/16 of an inch. Outside corners of the cover shall be slightly rounded.

**3.3.4.6 Binding.** — The binding shall be loose-leaf using 3/16 inch metal posts and screws, top and bottom posts 3/8 inch from the outside edge with the three posts spaced on 4-1/4 inch centers. Covers for manuals 1/2 inch thick or more shall have a binding flange of corrosion-resistant metal covered 700 quality fabrikoid. On manuals

containing less than 50 pages (25 sheets), split type metallic fasteners with metallic washers may be used. All metal parts shall be of corrosion-resisting material, or shall be treated to resist corrosion.

**3.3.4.6.1 Fillers.** — Fillers made of newsboard or similar material shall be inserted where needed to build up the binding edge to the same thickness as the outside edge. Fillers shall be spaced throughout the binding edge of the manual such that the pages of the manual shall not be bent.

**3.3.4.7 Drawings.** — When drawings are necessary to illustrate the description, operation and maintenance of the equipment or system, they shall be reduced in size as necessary (see figure 13) and reproduced in black and white. Each drawing shall be identified with the drawing number of the manufacturer and the bureau or agency concerned. See 3.3.2.6 regarding partial page figures and fold-over pages. Care shall be taken in the preparation of drawings for reproduction to insure that when the drawings are reduced in size they shall be clear and legible.

**3.3.4.8 Figures.** — (NOTE: This paragraph does not pertain to reduced size reproduction of approved drawings which may be extracted and used as figures in a manual.) The rendering of sketches (airbrushing or line rendering) shall be done with the highest possible contrast. Adjoining area of a figure having similar values shall be avoided. Edges of all silhouette half-tone figures shall be sharply defined by retouching. Exploded views and cutaways shall be drawn in perspective to appear as realistic as possible without distortion. Isometric views may be used for small parts or units which lend themselves to this method without showing noticeable distortion. Except for diagrams, schematic, orthographic projections, reproduction of approved drawings, all line sketches shall be prepared with the use of shading medium to clarify and model the form of the sketch. This rendering shall be kept as simple as possible. Fuzzy freehand lines, rendering with fine lines, and cross hatching shall be avoided. Solid black shall be used in dark areas to increase contrast and simplify the sketch. This applies to cutaway views, exploded views and cross section views.

**3.3.4.9 Reproduction copy.** — Reproduction copy shall be prepared in accordance with 3.3.4.3. If offset negatives are used in the publication of the manuals, a complete set of such negatives shall, after completion of the manuals, be delivered to the Naval Supply Depot, Mechanicsburg, Pennsylvania and shall remain the property of the Government for use in subsequent reproduction of the manuals. Regardless of the method of printing used, one glossy print or negative of each halftone figure included in the manuals, shall be delivered to the Naval Supply Depot, Mechanicsburg, Pennsylvania and shall remain the property of the Government for use in subsequent reproduction of the manuals. This requirement does not apply to manuals for which reproduction copy has been previously furnished. Where color is used (see 3.3.4.2) suitable copy for each separate color plate will be rendered properly identified showing register marks. Color plates shall also be forwarded to Naval Supply Depot, Mechanicsburg, Pennsylvania.

**3.3.4.10 Security requirements.** — The security requirements prescribed in Section IX — Graphic Arts of the Industrial Security Manual (DD Form 441-Attachment) shall be observed during the production, reproduction, and distribution of graphic arts involving classified information.

### **3.4 Type III manuals. —**

**3.4.1 Contents.** — Type III manuals shall contain the following information as applicable presented in the order specified as follows (see figures 1 to 13 inclusive):

- Front matter
- Section 1 — General information
- Section 2 — Operating instructions.
- Section 3 — Installation.
- Section 4 — Maintenance.
- Section 5 — Parts list.
- Section 6 — Drawings.
- Memorandum.

**Note.** — When a manual covers an equipment composed of several distinct units (for example, a pump unit consisting of a pump and motor), it may be necessary to arrange the manual in major divisions, each covering one unit. If so,

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the major divisions may be arranged by subdivisions, each corresponding to the requirements listed herein. The order listed herein may be altered with the approval of the bureau or agency concerned.

**3.4.1.1 Front matter.** — The front matter for type III manuals shall consist of the following.

- (a) Cover.
- (b) Title page.
- (c) Approval and procurement record page.
- (d) List of effective pages.
- (e) Correction page.
- (f) Table of contents.
- (g) List of figures.
- (h) List of tables.

**3.4.1.1.1** The list of effective pages shall be required in classified manuals only, and in multiple volume manuals shall be a separate page for the contents of each volume.

**3.4.1.1.2** The title page, table of contents, list of figures and list of tables shall be a separate page for the contents of each volume.

**3.4.1.1.3 Approval and procurement record page.** — In all final copies of the manual, the manufacturers shall include an approval and procurement record page inserted immediately following the title page. Figures 3a or 3b gives the format that shall be followed in its preparation.

**3.4.1.1.4 List of effective pages.** — A list of effective pages (see figure 4) shall be prepared for all final manuals classified for security purposes (see 3.1.4) and copies thereof. For multiple volume manuals there shall be prepared a separate list for the contents of each volume.

**3.4.1.1.5 Correction page.** — A correction page (see figure 5) shall be furnished for all final manuals and copies thereof for the purpose of making revisions in accordance with 3.1.6. For multiple volume manuals there shall be prepared a separate correction page for each volume.

**3.4.1.1.6 Table of contents.** — The table of contents (see figure 6) shall list all primary divisions and secondary subdivisions such as chapters, sections, and main paragraphs, with their corresponding paragraph numbers and page numbers. Where submanufacturers are furnishing associated equipment it shall be the responsibility of the prime contractor to integrate and reflect the information provided by the sub-manufacturers within the table of contents.

**3.4.1.1.7 List of figures and drawings.** — A list of figures (see figure 7) which have been assigned figure numbers shall be prepared. This list shall be arranged in numerical sequence, by figure number and shall give the figure title (see 3.4.3.7) and page number.

**3.4.1.1.8 List of tables.** — The list of tables (see figure 8) shall follow the list of figures and drawings. It shall include all tables assigned numbers and shall be arranged in numerical sequence by table numbers.

**3.4.1.2 Section 1 — General information.** — This section shall include general data, an introduction and a detailed description.

**3.4.1.2.1 General data.** — This portion of the manual shall contain the following data:

(a) Component list and performance design characteristics. The name of each component and the respective manufacturer's name with its complete rated performance characteristics for continuous or intermittent operation and, where applicable, maximum permissible overload characteristics and their duration. A description of the items shall be included to distinguish it from other items of the same general category. For instance, a motor shall be distinguished as to the specific type of motor for example, as a.c., synchronous, totally enclosed, etc.

- (b) Navy type designation.
- (c) Principal overall dimensions.

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(d) Weight (with or without packing).

(e) Allowable clearances, temperatures, pressures, pressure and blow range settings or tolerances shall be shown in tabular form.

**3.4.1.2.2 Introduction.** — This division shall include a general description of the equipment; explain briefly what it is, where it is used, and what it will do. All information of a general character applicable to the complete equipment shall be given. When the text contains technical terms, terms not commonly used, or symbols, definitions shall be included.

**3.4.1.2.3 Detailed description.** — This division shall contain a complete detailed description of units and assemblies which comprise the complete equipment; for example ship service turbogenerator, the turbine, reduction gear, generator, and exciter.

**3.4.1.2.4 Section 2 — Operating instructions.** — This division shall contain, simple, brief, and effective instructions, including normal routines and precautions to be observed in starting, operating, stopping or shutting down the equipment. Where operations are to be performed in specific sequence, step-by-step procedure shall be used. Operations shall be numbered in the order in which they are performed. Operating data which is frequently referred to in operating the equipment shall be included in this division. Tables and charts shall be used for the presentation of these instructions where varying operating conditions are encountered.

**3.4.1.2.5 Section 3 — Installation.** — This division shall contain methods of installation, including packing or unpacking, handling, preparation of site, alignment precautions, mounting instructions, bolting diagrams, recommendations regarding shielding, safety guards, grounding or bonding.

**3.4.1.2.6 Section 4 — Maintenance.** — This division shall cover all maintenance procedures and routine adjustments which should be performed periodically, as well as instructions for disassembly and replacement of worn or damaged parts. Instructions on lubrication shall be provided as applicable, preferably in chart form, and shall include the type of lubrication recommended by the manufacturer, together with specific time periods. Lubricants shall be described by Military Specification numbers, where applicable and by commercial designations. Maintenance instructions shall cover the use of special tools.

**3.4.1.2.7 Section 5 — Parts list.** — This section shall contain identification data covering all repair parts to facilitate ready identification of parts for replacement and ordering purposes.

**3.4.1.2.7.1 Contents.** — The parts list shall contain the following information arranged in an intelligible sequence:

(a) — Figure number. This shall denote the figure number whereon the part has been shown.

(b) — Index number. This number shall denote main assembly, subassembly or part identity on the reduced size drawing(s) or other figure(s) included in the manual. (This column may be eliminated when the part is identified by name on a figure.)

(c) — Nomenclature for part using actual manufacturer's name.

(d) — Number required.

(e) — Actual manufacturer's service part numbers.

**3.4.1.2.7.2 Special tools.** — A separate list shall immediately follow the parts tabulation under the heading "Special Tools" which are supplied with the equipment, that is, tools that are peculiar to the equipment showing the quantity, unit of issue (each, pair, set) description, and manufacturer's identification number.

**3.4.1.2.8 Section 6 — Drawings.** — This division shall contain drawings, additional block diagrams, exploded views or explanatory drawings, as necessary to supplement the descriptive matter contained in the text. Diagrams of switches and relays used in the system showing the terminal numbering shall be inserted as additional drawings. The standard color codes for resistors and capacitors shall be stated, where applicable.

**3.4.1.2.9 Memorandum pages.** — One blank sheet (two pages) shall be inserted at the end of the manual for memorandum purposes.



**MIL-M-15071C(SHIPS)****3.4.2 Format. -**

**3.4.2.1 Volumes. -** Should the summation of information submitted result in an unreasonably bulky manual, the information shall be divided into two or more volumes. The cover of each manual (volume) shall be printed in accordance with figure 1 with the addition of the following as to the respective volume number and the number of volumes comprising the total information furnished; for example, VOLUME I of III, VOLUME II of III, VOLUME III of III. Each volume shall be identified by the same NAVSHIPS number (see 3.1.2).

**3.4.2.2 Divisions (chapters or sections). -** Divisions of manuals shall be by chapters or sections, numbered or lettered consecutively (see 3.4.2.5). In general, chapters shall be the main divisions of larger manuals and sections shall be the main divisions of smaller manuals. Chapters of larger manuals may be further divided into sections.

**3.4.2.3 Page identification. -** At the top of each left hand page, flush with the outside margin, shall appear a briefed title of the manual. At the top of each right hand page, flush with the outside margin, shall appear the division, chapter, or section title.

**3.4.2.4 Paragraphs. -** Paragraphs shall not be titled or numbered more extensively than is necessary to facilitate reference. Individual paragraph numbering may be omitted, provided the text is so prepared that reference to each paragraph by number is unnecessary. Main paragraphs shall be numbered consecutively within each division, chapter or section, using Arabic numerals separated by a dash. The number following the dash will indicate the number of the paragraph within the section; for example, "2-17" is the 17th paragraph of section 2. Similarly for manuals subdivided by chapter and section both the chapter and section number shall precede the paragraph number; for example, "2-4-10" is the 10th paragraph of section 4 contained in chapter 2. The main paragraph numbers and title shall stand alone on one line (see figures 9 and 10).

**3.4.2.5 Numbering. -** Front matter pages shall be numbered in lower case Roman numerals. The cover, title page, and approval and procurement record pages shall not be numbered. Pages of the manual(s) shall be numbered consecutively within each division, chapter (or section). Arabic numerals shall be used for numbering for all pages other than the front matter. All odd numbered pages shall appear as right hand pages. Pages, tables, and figures which are referred to in the manual shall be numbered consecutively within each chapter (or section) but each starting with the number "ONE". The page, table, and figure number shall be preceded by the chapter (or section) number. For example, page 3 in section 4 shall be numbered page 4-3, table 5 in section 2 shall be numbered table 2-5, figure 2 in section 1 shall be numbered figure 1-2. Where manuals are divided by chapter and section the chapter and section number both shall precede the page, table, and figure number. Page numbers shall be placed at the lower outer corner of the page.

**3.4.2.5.1** Fold over pages shall be right hand pages printed on one side only and when they are used they shall be assigned two page numbers. The page numbers shall appear on the face of the sheet at the lower right hand corner (see figure 13). Fold over pages shall be arranged so that page numbers and figure numbers are visible without unfolding. Fold over arrangements shall be as shown on figure 13.

**3.4.2.6 Layout treatment. -** The layout of the manuals shall be such as to conserve space without detracting from the utility or clarity of the material presented. Blank pages and spaces shall be avoided wherever possible with the exception specified in 3.4.1.2.9 and in 3.4.2.6.1. Normally, textual material shall be printed on both sides of the sheet. Figures serving no instructional function or to which no reference is made in the text shall not be used. Partial page figures within the text are preferred although several small figures may be grouped to form a single page layout. Whenever possible, figures within the text shall be located so that reference can be made from applicable text without turning a page. Whenever it is necessary to include fold over pages they shall be inserted at the end of the applicable division, chapter or section.

**3.4.2.6.1** All drawings which are inserted as fold over pages shall be provided with a blank apron page at the left hand edge of the fold over page (see figure 13). This will permit the printed portion in its entirety to be visible while the text is being studied.

**3.4.3 Text. -**



**3.4.3.1 Wording.** — The text shall be factual, specific, concise, and clearly worded so as to be readily understandable to relatively inexperienced personnel involved in the operation and maintenance of the equipment, yet provide technicians with sufficient information to install, operate, service, and maintain the equipment at peak performance. Technical phraseology requiring a specialized knowledge shall be avoided except where no other wording will convey the intended meaning, in which case the technical term shall be defined.

**3.4.3.2 Emphasis.** — When necessary, emphatics such as "NOTE", "CAUTION", and "WARNING" shall be used as adjuncts to the text. These, however, shall be used as sparingly as is consistent with the real need. The appropriate adjunct to the text shall be selected in accordance with the following definitions:

- (a) "NOTE" — An operating procedure, condition, etc., which it is essential to highlight.
- (b) "CAUTION" — Operating procedures, practices, etc., when if not strictly observed, will result in damage or destruction of equipment.
- (c) "WARNING" — Operating procedures, practices, etc., which will result in personal injury or loss of life if not correctly followed.

**3.4.3.3 Grammatical person and mode.** — The second person imperative shall be used for operational procedures; for example: "Disengage jacking gear from main engine reduction gears." The third person indicative shall be used for description and discussion; for example: "The jacking gear rotates the main shaft and main engine by engagement of the main reduction gears."

**3.4.3.4 Nomenclature consistency.** — Nomenclature used shall be consistent throughout the manual. For example, a part once identified as a "cover" shall not be referred to elsewhere as a "plate". That portion of the nomenclature that is used shall agree with the parts list nomenclature.

**3.4.3.5 Tables and charts.** — The use of tables and charts is desirable. Tables and charts shall be as simple as possible with sufficient explanation to make them easily used and understood. When material is presented in tabular form for ready reference purposes, as when listing weights, measures, condensed trouble shooting information, etc., the tabulation shall be numbered by table (or chart) number and chapter (or section) number. Thus table 3 in chapter 4 shall be numbered table 4-3.

**3.4.3.6 Measures.** — The system of standard U. S. customary units of weights and measures shall be used. As a general rule all references to liquid capacities shall be given in U. S. standard units of liquid measure. When scientific or medical equipment is of a type which makes reference to metric weights and measures customary, such reference may be used.

**3.4.3.6.1 Temperature reference.** — Temperature readings shall be given in degrees Fahrenheit or degrees Centigrade (Celsius), whichever is standard in U. S. industry. (In general, Fahrenheit is used with mechanical equipment and Centigrade (Celsius) is used with electric equipment.) One may follow the other in parentheses, for example: 194°F. (90°C) or 90°C. (194°F.).

**3.4.3.7 Figures.** — A view of each assembly, sub-assembly and the component parts thereof shall be shown as necessary to supplement the text and aid in the identification of parts. Identification of illustrated parts with the listed parts shall be facilitated by the use of key numbers (or more commonly known as piece numbers or index numbers) and arrows which will identify assemblies, sub-assemblies, and component parts. Figures of the exploded type may be used. When the use of exploded views is not practical, simple cross sectional views may be used. It is preferable when cross sectional views are used that they be approved drawings or excerpts from approved drawings. In the event no applicable drawing is available, cross sectional views from manufacturer's drawings may be used. Reduced figures for reproductions from validated master figures do not require revalidation.

**3.4.3.8 Figure titles.** — Figure titles shall indicate clearly in a brief descriptive phrase what is portrayed, by giving the function or process illustrated, the nomenclature of the equipment shown, or other pertinent and quickly understood identification.

Examples:

- (a) Wing hydraulic system.



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- (b) Model D-3-401 wheel assembly.
- (c) Measuring o.d. of clutch cone
- (d) Removing rotor and plate with fixture.

**3.4.3.9 Indexing and referencing of figures. —**

**3.4.3.9.1** Significant features or components of figures shall be identified by brief applicable nomenclature with arrows. Index numbers may be used on figures with explanatory legend on the sketch or photo when an extremely large amount of nomenclature is required.

**3.4.3.9.2** In order to assure a clear definition of lines where they pass through light and dark areas, arrows (leaders) shall be drawn in black with one edge outlined in white. The arrow head, however, shall be completely outlined in white. The thickness of arrows shall be uniform and no greater than necessary to indicate clearly the required details.

**3.4.3.9.3** Index references and letterings (nomenclature) shall be planned to reproduce uniformly a size not less than 10 point type.

**3.4.3.9.4 Deleted figures.** — When a change requires deletion of a figure without substitution of another, the following sentence shall be inserted "Figure\_\_\_\_\_deleted" in or near the place of deletion.

**3.4.3.9.5 Multiple reference.** — Where references are made in a paragraph to several items in the same figure, as in instructions detailing maintenance procedures, the figure number need be given only once at the beginning of the references (usually the beginning of the paragraph) with index numbers (or reference designations) of the items placed in parentheses in the body of the text where pertinent. Care shall be taken that such references are entirely clear. An example is the following portion of a paragraph:

"10. DISASSEMBLY OF AIR VALVE (see figure 1-5)

a. Unscrew safety disc retainer (2) from valve body (1) and remove safety disc (3) and safety disc washer (4)"

**3.4.3.9.6 Reference to figures.** — Where reference is made to figures, the reference shall be to the figure number and the chapter (or section) number. The page number shall not be used. Where reference is made to items shown on figures by index numbers, figure number and index number shall be indicated as follows: "Remove nut (7) and drive out bolt (8) (see figure 1-5)."

**3.4.3.9.7 Specification and standard references.** — When Government specifications or standard numbers are referred to, only the basic numbers shall be mentioned, omitting the revision letter suffix unless it is essential to mention a particular issue of a specification or standard. References to specifications and standards shall be made as follows: "Federal Specification P-S-661", "Military Specification MIL-C-5020", "Military Standard MIL-STD-105", etc. All materials required for maintenance referred to in the manual, such as lubricants, solvents, additives, sealing materials, abrasives, etc., shall be described by military specification numbers where applicable. Commercial designations may be used when there is no applicable government specification.

**3.4.3.9.8 Numbers.** — Numbers used at the beginning of a sentence shall be spelled out and followed by the numeral in parentheses.

**3.4.4 Production and reproduction for type III manuals. —**

**3.4.4.1 Graphics.** — The quality of art work for type III manuals (such as photographs, renderings, line drawings and diagrams) shall conform to the quality requirements of Standard MIL-STD-218-2.

**3.4.4.1.1 Photographs.** — Photographic figures shall be prepared with equipment capable of reproducing all details and shall show clearly the subject matter. Photographs shall be uniformly retouched as necessary to define shapes, accentuate details, and establish correct tone value of sufficient contrast for photolithographic reproduction.

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**3.4.4.1.2 Exploded views.** — Exploded views may be used for representation of parts of machinery or equipment to show proportionate size, proper relation to other parts, and assembly or disassembly sequence. It is preferable that all parts be exploded in isometric projection on their line of assembly axis (see figure 12).

**3.4.4.2 Color.** — Color shall be used functionally where it is absolutely necessary to show electrical or mechanical circuits, the flow of materials, schematic diagrams or operational diagrams. Cross hatching or similar methods of media shall be employed in lieu of color wherever possible. Color selection shall be based on the primary colors, which may be used in flat combination or screened for texts. A legend on the artwork shall explain the significance of each color used. In no case shall color be used for backgrounds or other decorative purpose.

**3.4.4.3 Printing.** — Printing shall be done by either photo-offset, or letterpress method, and shall be of equal quality to first class commercial work. Reproduction copy may be type-set, varityped, or typewritten with a standard typewriter. In general, type-set copy is preferred with varityped or typewritten copy as second choice. Final typed manuscript shall conform to the requirements of Standard MIL-STD-218-3. The style of composition to be used, however, shall be governed by the quantity of manuals to be produced, the relative costs of the several methods and the availability of material prepared for earlier manuals. The contractor shall specify the method of composition to be used when manuscripts or sample copies are submitted for approval. The bureau or agency concerned may request data from the contractor to substantiate the method of composition chosen if deemed necessary.

**3.4.4.3.1 Arrangement.** — The text may be arranged in the form of either two vertical columns or a single wide column. The two column arrangement shown on figure 10 is preferred; the single column arrangement is shown on figure 9. Right hand margins shall not necessarily have lines flush at the right, but care shall be taken to prepare a generally uniform margin. Final trim size shall be 8-3/8 by 10-7/8 inches. Text shall be printed on both sides except as otherwise specified herein for fold over pages.

**3.4.4.4 Paper.** — The paper for the photo-offset reproduction shall be preferably 25 by 38-50/500 basic offset; for letterpress 25 by 38-70/500 basic dull coated book paper.

**3.4.4.5 Covers.** — Covers for manuals less than 1/2-inch thick (less cover) shall be of the bellows fold type and of a black fabrikoid material, weight 6-1/2 to 7-1/2 ounces per square yard (finished cloth). Covers for manuals over 1/2 inch thick shall be made of semiflexible board covered with black fabrikoid material, weight 6-1/2 to 7-1/2 ounces per square yard. The information shown on figure 1 shall be imprinted in gold, silver, or aluminum color on the cover. Backbones of manuals over 1/2 inch thick shall be imprinted with the NAVSHIPS number (Navy identification number) and title in brief. Covers shall overlap the top, bottom, and outside edge of the manual by 3/16 of an inch. Outside corners of the cover shall be slightly rounded.

**3.4.4.6 Binding.** — The binding shall be loose-leaf using 3/16 inch metal posts and screws, top and bottom posts 3/8 inch from the outside edge with the three posts spaced on 4-1/4 inch centers. Covers for manuals 1/2 inch thick or more shall have a binding flange of corrosion-resistant metal covered 700 quality fabrikoid. On manuals containing less than 50 pages (25 sheets), split type metallic fasteners with metallic washers may be used. All metal parts shall be of corrosion - resisting material, or shall be treated to resist corrosion.

**3.4.4.6.1 Fillers.** — Fillers made of newsboard or similar material shall be inserted where needed to build up the binding edge to the same thickness as the outside edge. Fillers shall be spaced throughout the binding edge of the manual such that the pages of the manual shall not be bent.

**3.4.4.7 Drawings.** — When drawings are necessary to illustrate the description, operation and maintenance of the equipment or system, they shall be reduced in size as necessary (see figure 13) and reproduced in black and white. Each drawing shall be identified with the drawing number of the manufacturer and the bureau or agency concerned. Also see 3.4.2.5 regarding partial page figures and fold over pages. Care shall be taken in the preparation of drawings for reproduction to insure that when the drawings are reduced in size they shall be clear and legible.

**3.4.4.8 Figures.** — (NOTE: This paragraph does not pertain to reduced size reproduction of approved drawings which may be extracted and used as figures in a manual). The rendering of sketches (airbrushing or line rendering) shall be done with the highest possible contrast. Adjoining area of a figure having similar values shall be avoided. Edges of all silhouette halftone figures shall be sharply defined by retouching. Exploded views and cut-away views shall be drawn in perspective to appear as realistic as possible without distortion. Isometric views may



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be used for small parts or units which lend themselves to this method without showing noticeable distortion. Except for diagrams, schematics, orthographic projections, reproduction of approved drawings, all line sketches shall be prepared with the use of shading medium to clarify and model the form of the sketch. This rendering shall be kept as simple as possible. Fuzzy freehand lines, rendering with finelines, and cross hatching shall be avoided. Solid black shall be used in dark areas to increase contrast and simplify the sketch. This applies to cutaway views, exploded views and cross section views.

**3.4.4.9 Reproduction copy.** — Reproduction copy shall be prepared in accordance with 3.4.4.3. If offset negatives are used in the publication of the manuals, a complete set of such negatives shall, after completion of the manuals, be delivered to the Naval Supply Depot, Mechanicsburg, Pennsylvania and shall remain the property of the Government for use in subsequent reproduction of the manuals. Regardless of the method of printing used, one glossy print or negative of each *halftone* figure included in the manuals, shall be delivered to the Naval Supply Depot, Mechanicsburg, Pennsylvania and shall remain the property of the Government for use in subsequent reproduction of the manuals. This requirement does not apply to manuals for which reproduction copy has been previously furnished. Where color is used (see 3.4.4.2) suitable copy for each separate color plate will be rendered properly identified showing register marks. Color plates shall be forwarded to Naval Supply Depot, Mechanicsburg, Pennsylvania.

**3.4.5 Security requirements.** — The security requirements prescribed in Section IX — Graphic Arts of the Industrial Security Manual (DD Form 441 — Attachment) shall be observed during the production, reproduction and distribution of graphic arts involving classified information.

**3.5 Type IV manuals. —**

**3.5.1 Contents.** — Type IV manuals shall consist of manufacturer's standard commercial instructions and parts lists bound together. Production drawings prepared for the manufacture of the equipment(s) when required may be included to supplement the standard manufacturer's instructions. All final manuals shall include an approval and procurement record page (see figures 3a and 3b).

**3.5.2 Covers.** — Covers shall be of a black fabrikoid or leatheroid material. The cover shall bear the information shown on figure 1 and shall be located in accordance with the format shown thereon.

**3.5.3 Binding.** — The manual and covers shall be bound either by stapling, stitching or by use of metal binding posts.

**3.6 Distribution requirements. —**

**3.6.1** Unless otherwise specified in the contract or order, distribution of all *final manuals not exactly identical* to ones previously procured and assigned a NAVSHIPS number shall be as follows:

(a) Two copies packed with each unit of equipment procured but not to exceed six for ultimate placement aboard a single ship shall be provided. The requirement for concurrent delivery of these manuals with the equipment cannot be over emphasized since they are absolutely essential for effective shipboard installation, operation and maintenance of the equipment for which they are supplied.

(b) Two copies to the Bureau of Ships.

(c) Two copies to the cognizant Supervisor of Shipbuilding when the equipment is to be installed by a private shipyard.

(d) One copy to each U. S. Naval Shipyard, except Pearl Harbor and Portsmouth Naval Shipyards (total of nine).

(e) Two copies to the Commander, Pearl Harbor Naval Shipyard (for submarine equipment and surface ship equipment).

(f) Two copies to the Commander, Portsmouth Naval Shipyard (for submarine equipment only).

(g) One copy to the cognizant Inspector of Naval Material.

(h) Two copies to the Submarine Supply Office, Philadelphia, Pennsylvania (submarine equipment only).

(i) Two copies to all Submarine Tenders (submarine equipment only).

(j) Two copies to the Commander, Submarine Base, New London, Connecticut (submarine equipment only).

(k) Three copies to the Commanding Officer, Ships Parts Control Center, Mechanicsburg, Pennsylvania.

MIL-M-15071C(SHIPS)

- (1) Two copies of the approval and procurement record page, (see figures 3a or 3b) to the Commanding Officer, Ships Parts Control Center, Mechanicsburg, Pennsylvania, (for record purposes only).
- (m) Two copies of the approval and procurement record page, (see figures 3a or 3b) to the Bureau of Ships (for record purposes only).
- (n) Manuals for stock shall be in the following quantities:

<i>Number of equipments</i>	<i>Number of copies</i>
1 to 10	5 plus 1 per equipment
11 to 25	25
26 to 40	35
41 to 60	50
61 to 100	65
101 to 150	80
151 to 200	100
201 and over	1 for every 2 identical equipments procured

These manuals shall be shipped to:

Commanding Officer  
Naval Supply Depot  
(For Stock)  
Mechanicsburg, Pennsylvania

3.6.2 Unless otherwise specified in the contract or order, distribution of all final manuals exactly identical to ones previously procured and approved (as evidenced by a previously assigned NAVSHIPS number ) (see figures 3a and 3b) shall be as follows:

- (a) Two copies packed with each unit of equipment procured but not to exceed six for ultimate placement aboard a single ship shall be provided. The requirement for concurrent delivery of these manuals with the equipment cannot be over emphasized since they are absolutely essential for effective shipboard installation, operation and maintenance of the equipment for which they are supplied.
- (b) Two copies to the cognizant Supervisor of Shipbuilding when the equipment is to be installed by a private shipyard.
- (c) Two copies of the approval and procurement record page, (see figures 3a or 3b) to the Commanding Officer, Ships Parts Control Center, Mechanicsburg, Pennsylvania, (for record purposes only).
- (d) Two copies of the approval and procurement record page, (see figures 3a or 3b) to the Bureau of Ships, (for record purposes only).

3.6.3 Unless otherwise specified in the contract or order, distribution of all final manuals for ships being constructed, reactivated, converted or otherwise readied for transfer under the Mutual Defense Assistance Program (MDAP) shall be as follows:

- (a) Two copies packed with each unit of equipment procured but not to exceed six for ultimate placement aboard ship shall be provided. The requirement for concurrent delivery of these manuals with the equipment cannot be over emphasized since they are absolutely essential for effective shipboard installation, operation and maintenance of the equipment for which they are supplied.
- (b) Six copies per equipment for each ship to be transferred under MDAP to a foreign government. These copies shall be sent to the Military Assistance Advisory Group (MAAG) of the recipient country for delivery to the foreign government which is to receive the ship.
- (c) One copy to the Washington, D. C. Naval Attache of the foreign government to receive the ship.
- (d) Two copies to the Bureau of Ships.
- (e) One copy to the cognizant Supervisor of Shipbuilding when the equipment is to be installed at a private yard.
- (f) One copy to the cognizant Inspector of Naval Material.

**MIL-M-15071C(SHIPS)**

(g) Twelve copies to:

Commanding Officer  
Naval Supply Depot  
(For Stock)  
Mechanicsburg, Pennsylvania

(h) Two copies of the approval and procurement record page (see figures 3a or 3b) to the Commanding Officer, Ships Parts Control Center, Mechanicsburg, Pennsylvania (for record purposes).

(i) Two copies of the approval and procurement record page, (see figures 3a or 3b to the Bureau of Ships (for record purposes only).

**3.7 Workmanship.** — The workmanship shall be of high quality, comparable in text, compilation, arrangement, and accuracy to high grade commercial manuals and parts catalogs and shall be satisfactory to the bureau or agency concerned. Copy which has filled letters or is blurred will not be acceptable.

#### **4. QUALITY ASSURANCE PROVISIONS**

**4.1 Approval procedures.** — The methods of approval shall be as specified in 3.1.8.1.

**4.2 Inspection procedures.** — For Naval purchases, the general inspection procedures shall be in accordance with the General Specifications for Inspection of Material.

#### **5. PREPARATION FOR DELIVERY**

**5.1 Manuals accompanying equipment.** — One or two copies, as specified in the contract or order, of the manual shall be packed within the shipping container holding the main unit of equipment. The manual(s) shall be so placed that they are readily accessible prior to removing the equipment and shall not be placed within the water vaporproof barrier material used to enclose the equipment. Manuals accompanying equipment shall be packaged in accordance with method 1C-3 of Specification MIL-P-116 except the manuals accompanying the equipment packed by level C shall be packaged in accordance with commercial practice. The packing list shall indicate which container includes the manuals.

##### **5.2 Bulk manuals.** —

###### **5.2.1 Packing.** —

**5.2.1.1 Level A.** — Manuals, in multiples of 10 when practical, shall be packed in overseas type wood cleated fiberboard, nailed wood, wirebound wood, corrugated or solid fiberboard, wood cleated paper overlaid, or wood cleated plywood boxes, conforming to Specifications PPP-B-591, PPP-B-621, PPP-B-585, class 2 or 3, JAN-P-108, MIL-B-10377 or PPP-B-601, respectively. Shipping containers shall have caseliners conforming to Specification MIL-L-10547 and shall be closed and sealed in accordance with the appendix thereto. Caseliners for boxes conforming to Specification JAN-P-108 may be omitted provided all joints of the boxes are sealed with tape as specified in the appendix of the box specification. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitations of the applicable box specification.

**5.2.1.2 Level B.** — Manuals, in multiples of 10 when practical, shall be packed in domestic type wood cleated fiberboard, nailed wood, wirebound wood, corrugated or solid fiberboard, wood cleated plywood, or wood cleated paper overlaid boxes conforming to Specifications PPP-B-591, PPP-B-621, PPP-B-585, LLL-B-631, LLL-B-636, PPP-B-601 or MIL-B-10377, respectively. Closures shall be as specified in the applicable box specification or appendix thereto. Fiberboard boxes shall conform to the special requirement of the applicable box specification. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitations of the applicable box specification.

**5.2.1.3 Level C.** — Manuals shall be packed in a manner to insure safe delivery and acceptance at destination. Containers shall comply with the Consolidated Freight Classification Rules or other carrier regulations applicable to the mode of transportation.

**5.2.2 Security requirements.** — All classified material shall be prepared for delivery in accordance with DD441 (ATTACHMENT).

**5.3 Marking.** — In addition to any special marking specified in the contract, order, or herein, each unit and intermediate package and shipping container shall be marked in accordance with Standard MIL-STD-129.

## 6. NOTES

**6.1 Ordering data.** — Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type of manual required (see 1.2).
- (c) Security classification, if required (see 3.1.4).
- (d) Special requirements for type I manuals (see 3.2) when appropriate.
- (e) Quantity of preliminary manuals required, delivery date and delivery destination(s).
- (f) Quantity of final manuals required, delivery date, and delivery destination(s) (see 3.6).
- (g) Details of special requirements for drawings, charts, and illustrations, pertinent to the particular equipment, if not covered by the equipment specification.
- (h) Levels of packing required (see 5.1 and 5.2).

**6.2 Superseding data.** — Types of manuals have been superseded as follows:

MIL-T-15071B

MIL-M-15071C

Type A

Type I

Type B

Type II

Type C

Type III

Type D

Type IV

**Notice.** — When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.





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BUREAU IDENTIFICATION NUMBER OF MANUAL appears in upper left-hand corner, set in 18 pt. Stymie light caps with Stymie bold numerals.

SECURITY CLASSIFICATION (see 3.1.4) appears in upper left-hand corner, set in 18 pt. Stymie light caps.

MULTIPLE-VOLUME MANUALS applicable to the same equipment shall be identified as to the particular volume and the number of volumes comprising the total information. Single-volume manuals need not be so annotated. This annotation shall be set in 18 pt. Stymie light caps with Roman numerals.

SERIAL NUMBER (see DD441 Attachment) appears in upper right hand corner, set in 18 pt. Stymie light caps. (Serial number assigned in this case is Serial No.-1). Serial numbers are not required for unclassified manuals.

PUBLICATION shall be defined as "MANUAL, TECHNICAL" and so annotated. Type set in 24 pt. Stymie extra bold upper and lower case.

SPECIFIC TITLE OF MANUAL set in 30 pt. Stymie extra bold caps.

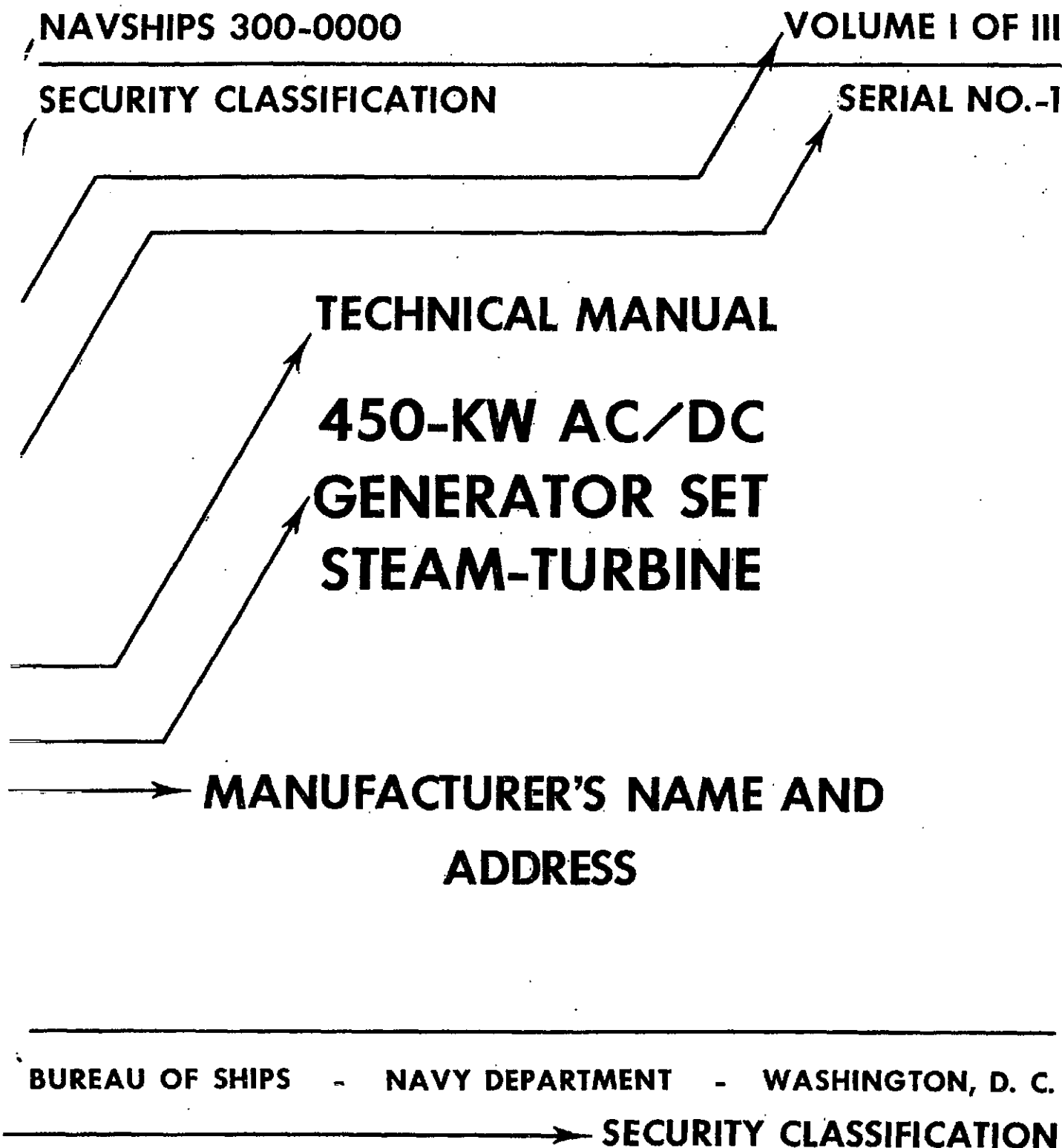
MANUFACTURER'S NAME AND ADDRESS set in 24 pt. Stymie extra bold caps.

NAME OF BUREAU, NAVY DEPARTMENT, WASHINGTON, D. C., to be set at bottom of page in 12 pt. Stymie light caps, letter spaced and separated as shown.

SECURITY CLASSIFICATION (see 3.1.4) appears in lower right-hand corner, set in 18 pt. Stymie light caps.

NOTE - If Stymie is not available, the following faces may be substituted: Gothic, Alternate Gothic, Futura, and Sans Serif.





**FIGURE 1 - TYPICAL COVER**



SECURITY CLASSIFICATION (see 3.1.4) appears in upper right-hand corner set in 18 pt. Stymie light caps.

BUREAU IDENTIFICATION NUMBER OF MANUAL appears in upper left-hand corner, set in 18 pt. Stymie light caps with Stymie Bold numerals.

SERIAL NUMBER (see DD441 Attachment) appears in upper left-hand corner, set in 18 pt. Stymie light caps. (Serial number assigned in this case is Serial No.-1). Serial numbers are not required for unclassified manuals.

MULTIPLE-VOLUME MANUALS applicable to the same equipment shall be identified as the particular volume and the number of volumes comprising the total information. Single-volume manuals need not be so annotated. This annotation shall be set in 18 pt. Stymie light caps with Roman numerals.

TYPE OF MANUAL (see 1.2) set in 24 pt. Stymie extra bold upper case.

PUBLICATION shall be defined as "MANUAL, TECHNICAL" and so annotated. Type set in 24 pt. Stymie extra bold upper case.

SPECIFIC TITLE OF MANUAL set in 30 pt. Stymie bold upper case.

"WARNING" paragraph shall be set in 8 pt. Stymie bold caps (see 3.1.4). This paragraph not required for unclassified manuals.

MANUFACTURER'S NAME AND ADDRESS set in 24 pt. Stymie extra bold caps.

CONTRACT NO. may, at the discretion of the manufacturer, be hand lettered, stamped or typewritten on the title page in lieu of being printed.

"NOTICE FOR REQUISITIONING" shall be set in 24 pt. Stymie extra bold caps.

MANUFACTURER'S BOOK NUMBER OR IDENTIFICATION.

NAME OF BUREAU, NAVY DEPARTMENT, WASHINGTON, D. C., to be set at bottom of page in 12 pt. Stymie light caps.

DATE OF MANUAL may, at the discretion of the manufacturer, be hand lettered, stamped or typewritten on the title page in lieu of being printed.

SECURITY CLASSIFICATION (see 3.1.4) appears in lower right-hand corner set in 18 pt. Stymie light caps.

NOTE: If Stymie is not available, the following faces may be substituted: Gothic, Alternate Gothic, Futura, and Sans Serif. Weights shown shall be maintained.

SERIAL NO.-1	SECURITY CLASSIFICATION
VOLUME I OF III	NAVSHIPS 300-0000
TYPE - I	
TECHNICAL MANUAL	
450-KW AC/DC	
GENERATOR SET	
STEAM-TURBINE	
"WARNING: This material contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law."	
MANUFACTURER'S NAME AND ADDRESS	
CONTRACT NOs 00000	
NOTICE: Additional copies of this or other manuals may be obtained from the U. S. Naval Supply Depot, Mechanicsburg, Pennsylvania. Manuals requested on equipment for which a NAVSHIPS identification number is not known may be obtained by furnishing complete identification plate data, service application and other characteristics of the equipment to aid in the identification of the applicable manual.	
MANUFACTURER'S BOOK NUMBER	
BUREAU OF SHIPS - NAVY DEPARTMENT - JUNE 1956	
SECURITY CLASSIFICATION	

FIGURE 2 - TYPICAL TITLE PAGE

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PAGE HEADING FOR IDENTIFICATION. \_\_\_\_\_

BASIC APPROVAL DATA shall include the applicable letters or correspondence granting approval in conformance with approval procedure specified in 3.1.8.1.

COLUMN HEADINGS FOR LISTING NECESSARY DATA. \_\_\_\_\_

DATA shall be listed in sequence by contract date with the latest contract appearing last as illustrated.

REMARKS space reserved for comments. \_\_\_\_\_

CERTIFICATION paragraph and date. \_\_\_\_\_

MANUFACTURER'S SIGNATURE. \_\_\_\_\_

NOTES:

1. This page is to be made of the same paper as the remainder of the manual and may be typed or printed. It shall be inserted within the manual immediately following the title page.
2. A manufacturer shall list only the present contract or order and two previous contracts or orders. Manufacturers with less than three previous contracts or orders shall list all previous contracts or orders.
3. This figure applies to preliminary and final manuals which are identical to those previously furnished. For preliminary and final manuals being furnished for the first time, see figure 3B.

# APPROVAL AND PROCUREMENT RECORD

## BASIC APPROVAL DATA FOR: NAVSHIPS 300-0000,

TITLE \_\_\_\_\_

Bureau of Ships letter Serial 544-654 of 18 April 1953.  
NAVSHIPS 300-0000 Model 67DR Dishwashing Machine. Supervisor of  
Shipbuilding, USN and Naval Inspector of Ordnance, New York Serial  
34567-987 of 16 March 1953, AKA150 Class/S45/11/8.

CONTRACT OR ORDER	DATE	VESSELS APPLICABLE	QUANTITY OF MANUALS	BUILDING YARD
917-7896-W1897	2-16-53	AKA156 DE113	56	A Shipyard Company Gamble, New York
NObs-76813	3-17-54	DE789 CVE888	45	B Iron Works Leadville, Penna.
NObs-67000	4-18-55	AMS198 SS111	8	C Iron Works Bath, Maine

### REMARKS:

None.

### CERTIFICATION:

DATE 1-1-56

It is hereby certified that the manuals to be provided under this contract (or order No.) NObs-67000 are exactly identical to NAVSHIPS 300-0000 approved by authority of basic approval data shown above. Further it is certified that this identical manual has been provided under other contracts or orders as listed above.

MANUFACTURER'S SIGNATURE

FIGURE 3A, APPROVAL AND PROCUREMENT RECORD PAGE



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PAGE HEADING FOR IDENTIFICATION. \_\_\_\_\_

BASIC APPROVAL DATA shall include the applicable letters or correspondence granting approval in conformance with approval procedure specified in 3.1.8.1. \_\_\_\_\_

COLUMN HEADINGS FOR LISTING NECESSARY DATA. \_\_\_\_\_

REMARKS space reserved for comments. \_\_\_\_\_

CERTIFICATION paragraph and date. \_\_\_\_\_

MANUFACTURER'S SIGNATURE. \_\_\_\_\_

NOTES:

1. This page is to be made of the same paper as the remainder of the manual and may be typed or printed. It shall be inserted within the manual immediately following the title page.
2. The manufacturer shall list the contract or order under which the final manual is being furnished for the first time.
3. This figure applies to preliminary and final manuals which are being furnished for the first time. For preliminary and final manuals identical to those previously furnished, see figure 3A.

■ 9999906 2107172 6T1 ■

**APPROVAL AND PROCUREMENT RECORD****BASIC APPROVAL DATA FOR: NAVSHIPS 300-0000,****TITLE**

Manual - Leslie Pump Pressure Governors and Strainers for Fuel Oil Service Pumps, NAVSHIPS 300-0000.

Approved by New York Naval Shipyard letter 252:ETE:mk, CVA62/S48 of 5 November 1956.

<b>CONTRACT OR ORDER</b>	<b>DATE</b>	<b>VESSELS APPLICABLE</b>	<b>QUANTITY OF MANUALS</b>	<b>BUILDING YARD</b>
------------------------------	-------------	-------------------------------	--------------------------------	--------------------------

N140(131)56253B	12-29-55	CVA62	28	New York Naval Shipyard Naval Base Brooklyn 1, New York
-----------------	----------	-------	----	---

**REMARKS:****CERTIFICATION:****DATE** 4-27-56

It is hereby certified that the manual, NAVSHIPS 300-0000, provided under this contract (or order No.) N140(131)56253B, has been approved by authority of basic approval data shown above.

**MANUFACTURER'S SIGNATURE**

FIGURE 3B, APPROVAL AND PROCUREMENT RECORD PAGE

EFFECTIVE PAGES

SECURITY CLASSIFICATION

FRONT MATTER

## LIST OF EFFECTIVE PAGES

PAGE NUMBERS	CHANGE IN EFFECT	PAGE NUMBERS	CHANGE IN EFFECT
Title Page	Original	4-1 through 4-25	Original
APR Page			
iii through vi	Original	5-1 through 5-20	Original
1-1 through 1-4	Original	6-1 through 6-28	Original
2-1 through 2-10	Original	7-1 through 7-15	Original
3-1 through 3-8	Original		

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Figure 4 – List of effective pages

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Correction Page

## RECORD OF CORRECTIONS MADE

PAGES	NUMBERS	DATE	SIGNATURE
Revised	1-6 through 1-8	2/56	John R. Smith
Revised	3-7 through 3-9	6/56	John R. Smith
New	2-14.1 through 2-14.3	7/56	John R. Smith
Revised	3-10 through 3-12	12/56	John R. Smith
Supplementary	3-14.1 through 3-14.3	2/57	John R. Smith

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1-0-2	Introduction .....	1-0-8
1-0-3	Detailed Description .....	1-0-9
<b>CHAPTER 2 – PRINCIPLES OF OPERATIONS</b>		
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2-1-2	Two-Stroke Cycle Engines .....	2-1-4
2-1-3	Scavenging .....	2-1-7
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2-3-2	Electrical Starting Systems .....	2-3-4
Section 4 – Governor Systems		
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2-4-2	Hydraulic Governors .....	2-4-4
2-4-3	Governor Applications .....	2-4-7
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-------	---------------------	-------

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CHAPTER 4 - INSTALLATION

## SECTION I

## INITIAL INSTALLATION

## 4-1-1 General.

Prior to shipment the engines, driven machinery and all connecting parts have been carefully tested, individually and in combination as complete units. The engines have had ample "run-in" and final inspection.

Installation drawings showing the over-all installation dimensions and clearances, as well as the location of all connecting piping flanges, are included at the end of this chapter. Fresh and sea water cooling, lubricating oil, air and fuel oil piping to be done by the shipbuilder and also shown in schematic diagrams on the installation drawings. Where possible, temporary cone-type strainers should be installed in the lines and removed upon completion of trials.

Diagrams and instructions for installation of the generator and switchgear will be found in the generator manufacturer's instruction book, Volume II.

Installation should be as described in the installation plans and the following instructions to insure good operating conditions for the engines and associated equipment.

For operators and repair base personnel, the installation specifications are of secondary importance. They should understand, however, those factors which, if altered or not kept in repair, might reduce the efficiency of or damage the engine and associated equipment.

## 4-1-2 Assembly.

The generator sets are completely assembled to the subbase, aligned and tested prior to shipment.

The sets are protected against vibration during shipment by the insertion of paper under the inertia flywheel and the generator pedestal bearing caps and under the generator brushes. The inertia flywheel is cushioned on a rubber pad and two wooden wedges are installed on each side between the flywheel and subbase cross member. The paper must be removed from under the bearing caps and the wedges removed from between the flywheel and subbase before the machinery can be rotated.

## 4-1-3 Mounting.

The foundations upon which the generator set subbase on propulsion engine mounting rails are to rest must be level athwartships and in parallel planes. All subbase and mounting bolts should be checked and torqued to the value specified before final installation and coupling alignment.

## 4-1-4 Coupling Alignment.

Sufficient time should be allowed after launching to permit swelling and tightening of the ships timbers and the ship should be weighted to the loaded waterline before the reduction gear and propeller shafts are finally aligned. At this time the alignment of the generator set subbases and foundations should be rechecked and the engine-to-fly-

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Model XXX - Propulsion  
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wheel and flywheel-to-generator couplings broken and the alignment checked. Alignment procedures are illustrated in Figure 4-1-1 below.

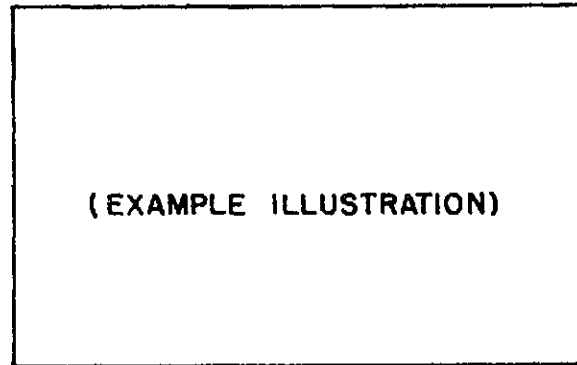


FIGURE 4-1-1 COUPLING ALIGNMENT

When measuring the face-to-face distance of the coupling, the shaft of the engine drive assembly should be pulled back toward the coupling to take up the end of the shaft.

If the coupling face-to-face distance is not as specified, the unit must be shifted ahead on its mounting and secured, after which the clearance and alignment should be rechecked before completion of the installation.

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CHAPTER 4 - INSTALLATION

## SECTION I

## INITIAL INSTALLATION

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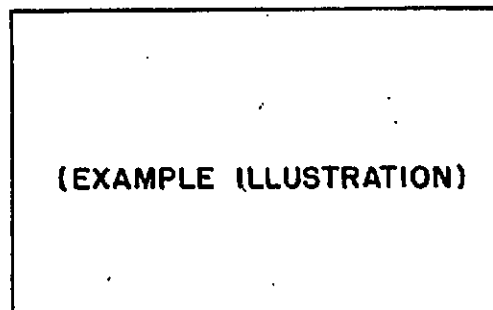


FIGURE 4-1-1 COUPLING ALIGNMENT

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If the coupling face-to-face distance is not as specified, the unit must be shifted ahead on its mounting and secured, after which the clearance and alignment should be rechecked before completion of the installation.

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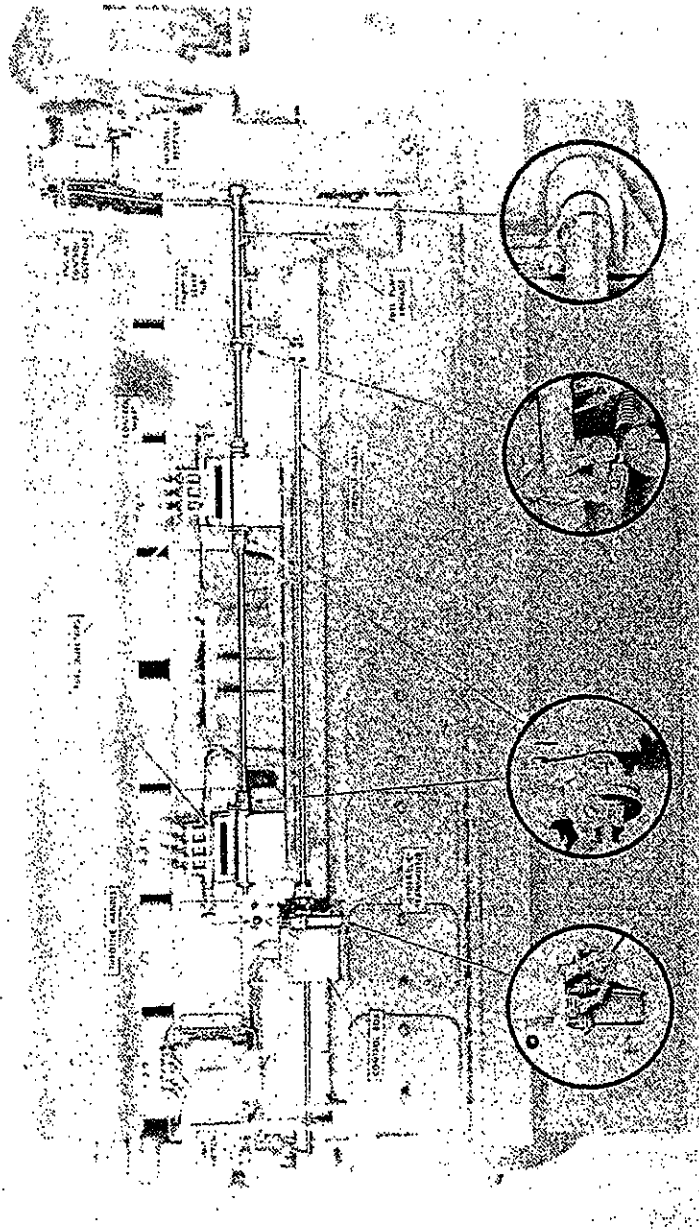
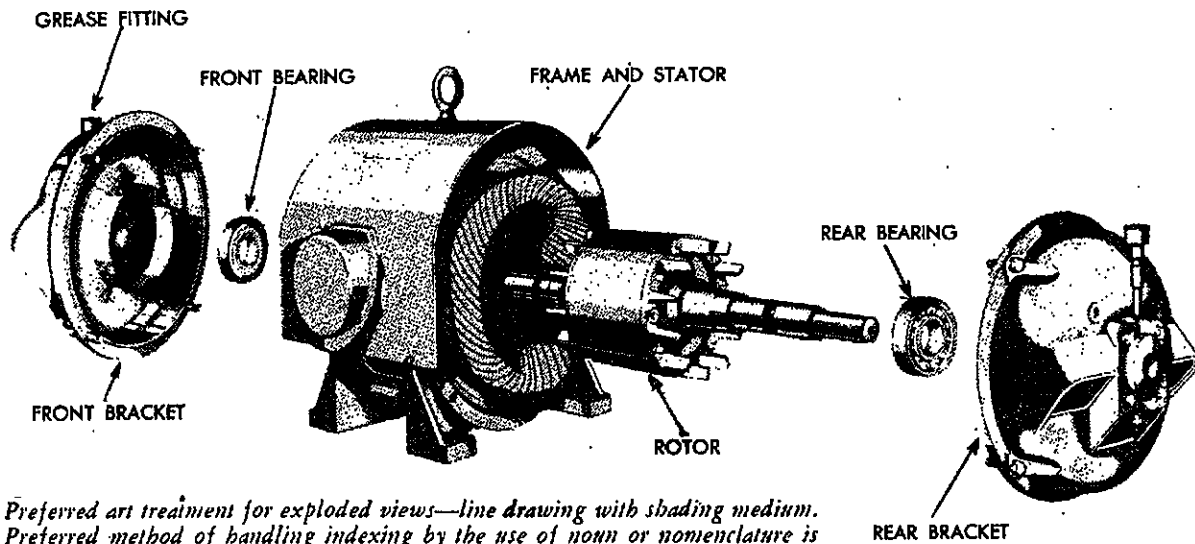


Figure 11. Engine control system.

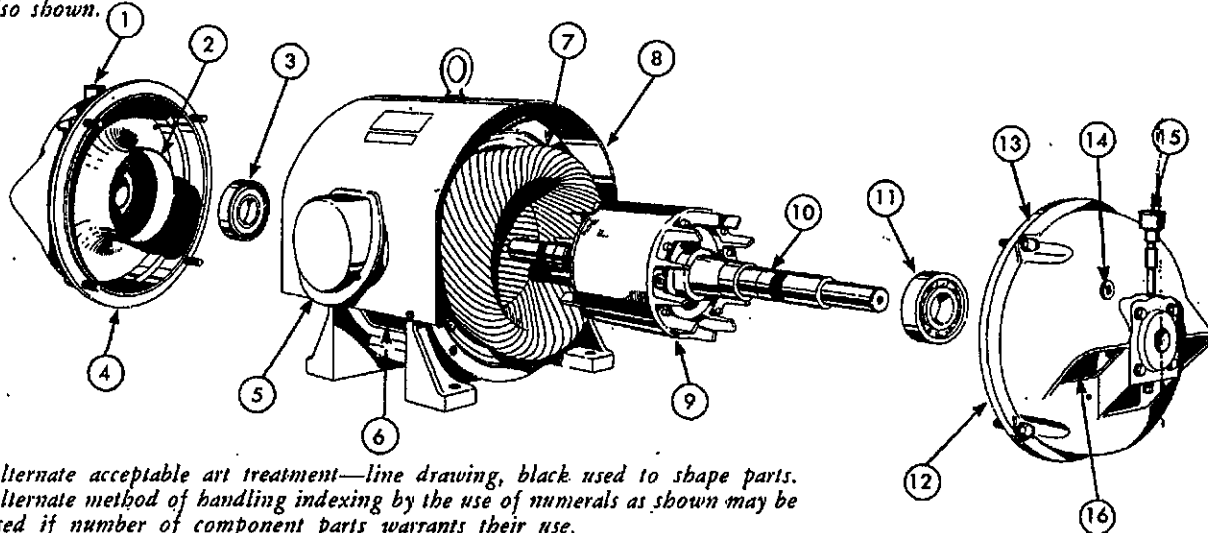
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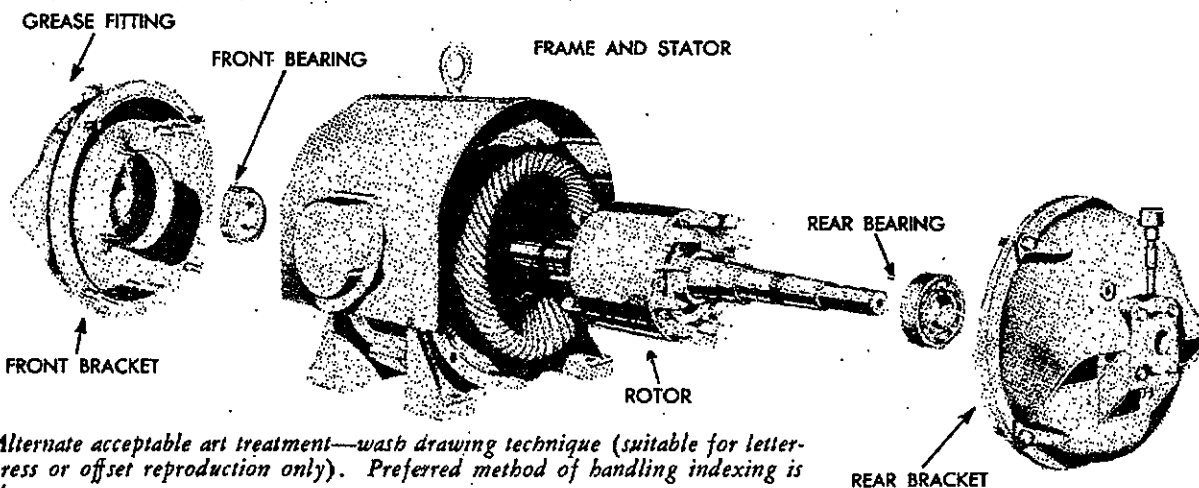
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*Preferred art treatment for exploded views—line drawing with shading medium. Preferred method of handling indexing by the use of noun or nomenclature is also shown.*



*Alternate acceptable art treatment—line drawing, black used to shape parts. Alternate method of handling indexing by the use of numerals as shown may be used if number of component parts warrants their use.*



*Alternate acceptable art treatment—wash drawing technique (suitable for letterpress or offset reproduction only). Preferred method of handling indexing is shown.*

NOTE.—Where letterpress or offset reproduction is to be employed, well-retouched photographs, exploded as per drawing shown above will also be acceptable.

Figure 12. Art treatment for exploded views.

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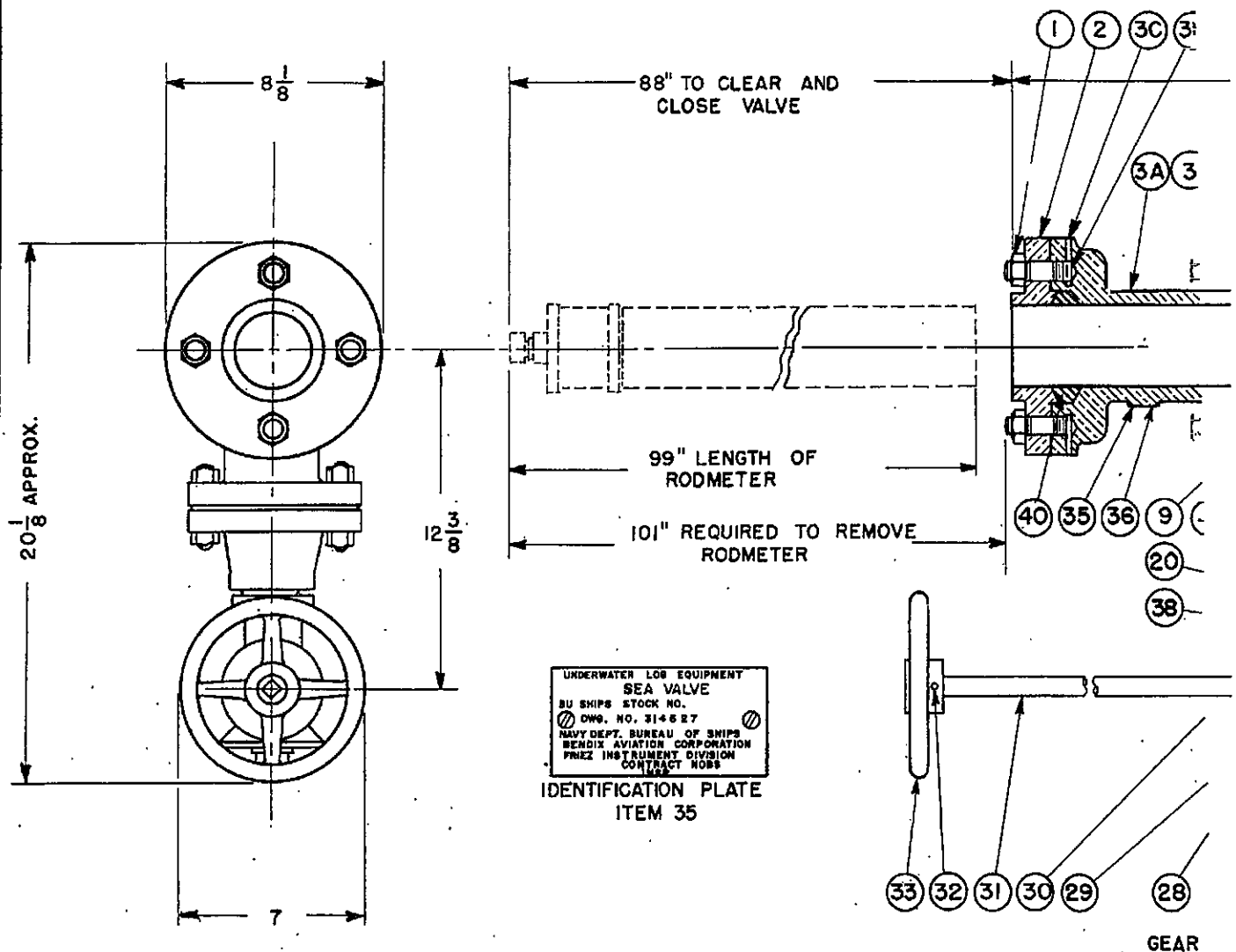
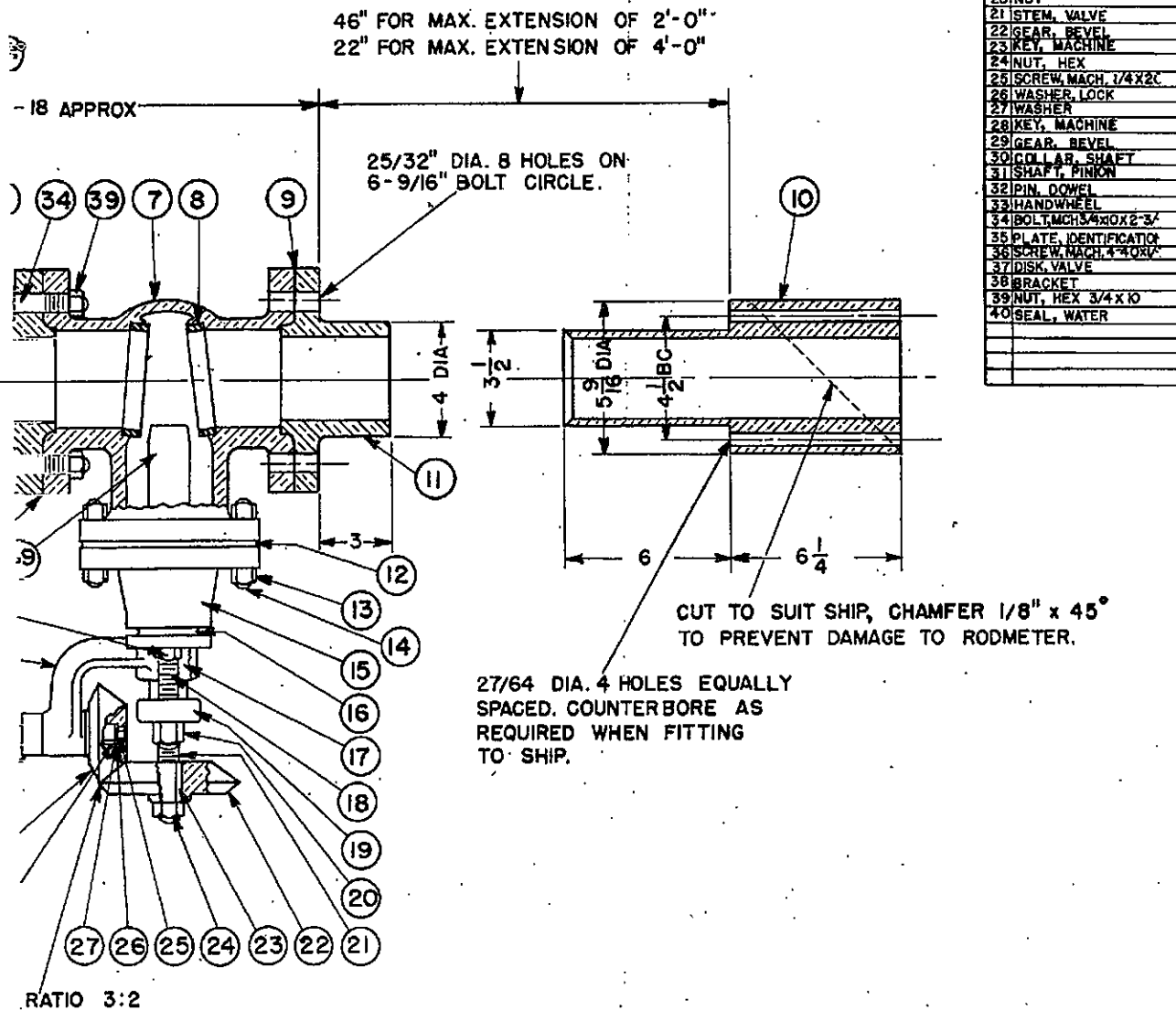


Figure 13.-Reduced size



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drawing with blank apron page to illustrate fold-over arrangement.

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LIST OF MATERIAL QUANTITIES FOR ONE SEA VALVE										REVISIONS			
NO. REQ.	MATERIAL	SPECIFICATION NUMBER	CONTRACTOR SERVICE SWD NO.	PT NO.	MANUFACTURER SERVICE PT. NAME OR PLAN NO.	BU SHIPS DWS NO.	UNIT WT. LBS.	STD NAVY STOCK NO.	REMARKS	REV. ZONE	DESCRIPTION	NFR. DATE APPD.	USN DATE APPD.
4	MONEL	QQ-N-281	314738-I-A										
1	MONEL	QQ-N-281	314746-A										
1			314743-I-A										
1	BRONZE	MIL-B-16541	314745-A										
4	MONEL	QQ-N-281	314735-A										
4	STEEL		314734-A						ZINC PLATE				
1	BRONZE	MIL-B-16541											
2	MONEL	MIL-N-20164											
2	RUBBER	MIL-R-1149	314739-A										
1	BRONZE	MIL-B-16541	314741-A										
1	BRONZE	MIL-B-16541	314742-A										
1	RUBBER	MIL-R-1149											
16	MONEL	QQ-N-281											
8	MONEL	QQ-N-281											
1	BRONZE	MIL-B-16541											
1	RUBBER	MIL-R-1149											
	ASBESTOS	MIL-P-17577							SYMBOL 1104				
2	MONEL	QQ-N-281											
1	MONEL	QQ-N-281											
4	MONEL	QQ-N-281											
1	MONEL	QQ-N-281											
1	GEAR BRONZE								P.D. 5 N.T. 30				
1	MONEL	QQ-N-281											
1	MONEL	QQ-N-281											
1	MONEL	QQ-N-281											
1	STEEL								ZINC PLATE				
1	BRASS												
1	MONEL	QQ-N-281							P.D. 3.333 N.T. 20				
1	GEAR BRONZE												
1	BRASS	MIL-N-994											
1	BRASS	MIL-N-994											
1	PHOS. BR.	MIL-B-892											
1	BRASS	MIL-B-17668											
8	MONEL	QQ-N-281	314737-A										
1	MONEL	QQ-N-281	314736-A										
2	BRASS												
1	MONEL	MIL-N-20164											
1	BRONZE	MIL-B-16541											
8	MONEL	QQ-N-281	314738-2-A										
1	RUBBER	MIL-R-900	314740-A										

## NOTES:

1. Pinion shaft, item 31, is furnished 56' long (from center line of valve) length to be cut to suit ship and handwheel pinned in place. Necessary bearing for shaft to be furnished by others.
2. At installation, item 10 and 11 must be rigidly held in alignment.
3. Where spec. no. is not noted, material of best commercial grade to be used.
4. Valve made in accordance with spec. MIL-V-20231 class III except as noted.
5. Components exposed to hydrostatic pressure shall withstand without damage or operational failure hydrostatic pressure of 550 lbs. per square inch for one hour.

## SECURITY CLASSIFICATION

DRAWN BY	MASTER PLAN	BENDIX AVIATION CORPORATION
CHECKED BY	UNDERWATER LOG	FRIEZ INSTRUMENT DIVISION
CHIEF DRAFT	EQUIPMENT	BALTIMORE, MARYLAND
	(IMPELLER TYPE)	REV. NO. 21487
APPRO. DATE	SEA-VALVE ASSEMBLY	NAVY DEPT. BU SHIPS
		CONTRACT NO. 47768
		BU SHIPS NO.
SHIPT'R.	BU SHIPS STOCK NO.	56005 H 3002712
TITLE	STD. NAVY STOCK NO.	
	SCALE 3"=1' UNIT V.C. 105187	

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SECURITY CLASSIFICATION

# Exhibit S

PCER AUDIT C

Number, Date, Superseding Data  
and Interest  
Essential Comments Included  
Figures returned  
Microprint panels returned

MIL-M-15071D(SHIPS)  
6 June 1961  
SUPERSEDING  
MIL-M-15071C(SHIPS)  
10 September 1957

*mcc* 8/29/61 MILITARY SPECIFICATION

(Revised) MANUAL, SERVICE (INSTRUCTION BOOKS) FOR SHIPBOARD

## ELECTRICAL AND MECHANICAL EQUIPMENT

### 1. SCOPE

1.1 Scope. - This specification sets forth Bureau of Ships requirements for classes and general contents of manuals necessary for the satisfactory operation, maintenance, installation, overhaul and repair, without the services of manufacturer's representative, of electrical, mechanical, hull, interior communication and fire control shipboard equipment. This specification also includes procedures for submission, review, approval and revision of the service manual. The intent is to accept the manufacturer's commercial type of manual or one prepared in accordance with his commercial practice whenever it is roughly equivalent to the detail requirements included herein.

1.2 Classification. - Service manuals shall be of the following classes:

Class A manual - A basic manual covering a family of equipment of the same basic design and one which can be made applicable to a specific equipment manufactured to that basic design by completing sheets and blanks.  
Class B manual - A manual covering a specific equipment for which a class A approval has not been obtained.

### 2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### MILITARY

MIL-D-963 - Drawing, Electrical, Hull and Mechanical Equipment for Naval Shipboard Use.

#### PUBLICATIONS

##### DEPARTMENT OF DEFENSE

DD Form 441 (Attachment) - Industrial Security Manual for Safe-guarding Classified Information.

Recorded	7/25/61
Board Cleared	
Coordinator	
File	

(Copies of specifications and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

OFFICIAL CLASSIFICATION COMMITTEE  
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd Street, New York 16, N. Y.)

### 3. REQUIREMENTS

#### 3.1 Media for final manuals and approval. -

3.1.1 Class A manuals. - Whenever a manufacturer's equipment lends itself to the preparation of a manual covering a family of equipments of the same basic design and one which can be made applicable to specific equipments of that design by completing sheets and blanks, the manufacturer may submit to the Bureau of Ships four copies of the basic manual together with examples of the sheets and blanks which will represent the detailed information to be provided for a specific equipment. Approval of a class A manual will be by the Bureau of Ships only and, once approved, the basic manual shall not be modified without the approval of the Bureau of Ships. At the time of class A manual approval, the Bureau will assign a NAVSHIPS number to the basic manual and forward one copy to the cognizant inspector for future comparison inspection with manuals furnished for specific equipments.

3.1.1.1 Once approval of a class A manual is granted for a particular basic design of equipment (and size range, if appropriate), the basic manual with the specific detailed information required for the unit of the family being furnished on a contract or order may be supplied by the manufacturer, in the quantities required by that order, without further approval. Copies of the manual prepared for the specific equipments shall be marked by the manufacturer with the NAVSHIPS number of the basic

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manual followed by "-1", "-2" or higher. Each dash number shall be assigned numerically by the manufacturer for each specific equipment of that family.

3.1.2 Class B manuals. - Class B manuals cover a specific equipment for which class A approval has not been obtained. Once a class B manual has been approved by the Bureau or its field representative, the manual shall not be modified without approval of the Bureau of Ships. (NOTE: Bureau of Ships field representative - Where the term "field representative" is used in this specification, it is limited to field representative of the Bureau of Ships, i.e. Supervisors of Shipbuilding, USN, U.S. Naval Shipyards and Industrial Manager, USN.) Whenever a manual for a specific equipment has not been approved previously, for this or a previous issue of this specification, prior to preparing final manuals, the manufacturer shall prepare and submit a sample manual for approval to one of the following activities, as appropriate:

- (a) Manuals procured on Bureau of Ships contracts - Contractor shall forward four sample copies to the Bureau of Ships for approval and assignment of a NAVSHIPS number with a copy of the forwarding document to the cognizant Government inspector.
- (b) Manuals procured on contracts issued by Naval activities other than Bureau of Ships - Contractor shall forward four sample copies to the Naval activity for approval.
- (c) Manuals procured for the Navy by a commercial activity (such as a private shipbuilder) - Contractor shall forward five sample copies to the commercial activity for approval of both the commercial activity and the cognizant Bureau representative.

3.1.2.1 The Bureau will assign a NAVSHIPS number to each different class B manual as follows:

- (a) Manuals procured on contracts issued by the Bureau of Ships - The NAVSHIPS number will be included in the approval letter.
- (b) Manuals procured on contracts issued by other activities.

The field approving activities may obtain NAVSHIPS numbers from the Bureau of Ships by one of the following methods:

- (a) Submit two copies of the manual prior or subsequent to the review and approval.
- (b) Permit the manufacturer to forward two copies of the manual to the Bureau simultaneously with the copies for approval.

- (c) In urgent cases, submit a letter containing the nameplate data of the equipment, the ship applicability and contract or order number.

3.1.2.2 Regardless of the method used for obtaining NAVSHIPS numbers, the letter request shall state the expected delivery date of the manuals and the quantity of manuals being furnished for stock.

3.1.3 Emphasis. - The bureau of Ships is mainly interested in the adequacy and completeness of contents and the clarity and readability of the information rather than the format. The manual shall be oriented toward operation, maintenance and repair of the equipment by the forces afloat, without the services of a manufacturer's representative. The portions devoted to descriptive matter and theory shall be limited to those which are essential to a proper understanding of the equipment for satisfactory operation, maintenance and repair. The text need not duplicate information which is adequately shown on the photographs, drawings and illustrations incorporated in the manual. (A class A or B manual may be the manufacturer's commercial manual, or one prepared in accordance with his commercial practice whenever it will be suitable for the service intended as determined by the approving activity.)

3.1.4 Security classification. - The security classification of manuals shall be as designated by the bureau or agency concerned. If classified, the security guide issued by DD form 254, forming a part of the contract shall be followed. All pages shall be marked in accordance with the requirements of the Industrial Security Manual for Safeguarding Classified Information (DD 441 (Attachment)). Where a minor amount of classified information is involved, two volumes - one unclassified and one classified shall be provided. The word "UNCLASSIFIED" need not appear on each page of unclassified portions of classified manuals. Revisions shall be classified as required by their subject matter. Regardless of the overall classification of a classified publication, an unclassified title shall be assigned whenever possible and consistent with security and clarity. In all cases, however, if a classified manual is involved, the initials of the classification assigned to the title, standing alone, shall be indicated in parentheses immediately following the title, using one of the following notation (U), (C), (S), (TS). In addition, the covers of classified manuals shall include the markings as indicated on figure 1.

3.1.5 Detail requirements. -

3.1.5.1 Contents. - Manuals shall contain the following information, arranged in an order appropriate to provide adequate instruction for operation

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and maintenance of each unit in the equipment and the complete assembly: No particular arrangement, format or chapter titles are required as long as the information is suitably presented.

Front Matter  
General Information  
Installation  
Principles of Operation  
Operating Instructions  
Maintenance and Repair  
Parts Lists

3.1.5.2 Front matter. - The front matter shall consist of the following:

- (a) Cover
- (b) Title page (for classified manuals only)
- (c) Approval and procurement record page
- (d) List of effective pages
- (e) Table of contents
- (f) List of figures
- (g) List of tables

3.1.5.2.1 Cover and title page. - The cover shall contain the information on figure 1. The title page for classified manuals shall conform to figure 2.

3.1.5.2.2 Approval and procurement record page. - The approval and procurement record (APR) page shall be the first page of unclassified manuals and shall follow the title page of classified manuals and shall conform to figure 3.

3.1.5.2.3 List of effective pages. - A list of effective pages shall be included. In multiple volume manuals, the list of effective pages shall be included in volume 1 only. The list of effective pages shall be modified whenever revisions are incorporated in copies of the manual.

3.1.5.2.4 Table of contents. - The table of contents shall list all primary divisions and secondary subdivisions such as chapters, sections and pages with their corresponding numbers. Where sub-manufacturers are furnishing associated equipment and a separate manual is not provided, it shall be the responsibility of the prime contractor to integrate and reflect the information provided by the sub-manufacturers within the table of contents. In multiple volume publications, a table of contents shall be prepared for each volume.

3.1.5.2.5 List of figures. - A list of figures shall be prepared listing all figures, their titles and numbers. In multi-volume publications, a list of figures shall be prepared for each volume.

3.1.5.2.6 List of tables. - A list of tables shall be prepared listing all tables, their titles and

numbers. In multi-volume publications, a list of tables shall be prepared for each volume.

3.1.6 General information. - General information shall consist of general data, a general description and detailed descriptions, as necessary to supplement data included in drawings and photographs.

3.1.6.1 General data. - General data shall consist of the following data for each component or unit:

- (a) Descriptive (name plate) data necessary to identify manufacturer, type, model and performance or design characteristics.
- (b) Principal overall dimensions.
- (c) Weight.
- (d) Allowable capacities, temperatures, pressures, settings, tolerances or other salient features as appropriate to the item shall be shown.

3.1.6.2 General description. - General description shall consist of a short general description of the equipment; explain briefly what it is, what it will do, and the general overall and interrelated operation of the various units. All information of a general character applicable to the complete equipment shall also be given. Where the text contains terms or symbols not commonly used, definitions or explanatory notes shall be included.

3.1.6.3 Detailed description. - Detailed description shall contain a complete detailed description of units and assemblies which comprise the complete equipment; for example: ship service turbo generator: the turbine, reduction gear, generator and exciter.

3.1.7 Installation. - Instructions, if necessary to supplement the installation drawings supplied (in accordance with Specification MIL-D-963), shall consist of methods of installation; including packing or unpacking, handling, preparation of foundation, alignment, precautions, mounting instructions, bolting diagrams, safety guards, grounding or bonding, clearances for access, ventilation, motion under shock, and methods of testing to assure satisfactory installation.

3.1.8 Principles of operation. - Figures, sketches, performance curves, and schematic wiring diagrams shall be included to the extent necessary to provide satisfactory operation, maintenance and repair. Operating sequences of automatic and semi-automatic equipment shall be indicated.

3.1.9 Operating instructions. - Information shall include routine and emergency procedures,